JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. C., No. 2326.—TUESDAY, DECEMBER 10, 1907.

EDITORIAL NOTES—GAS, &c.

The Gas Section at the Franco-British Exhibition.

IT is with satisfaction that prominence is given in our columns to the communication of Mr. James W. Helps, on the subject of the Gas Section at the Franco-British Exhibition. When Mr. Helps identified himself with the Committee, we felt that, if any man could with any hope of success essay to find a *via media* from the position created by on the one hand a somewhat hasty promise to assume charge of a Gas Section without taking all parties concerned into consultation, and on the other by the strong feeling on the part of the manufacturers that in this matter of exhibitions they were being unfairly taxed while there were two parties reaping—perhaps one more than the other—the resulting benefit, that man was Mr. Helps, confidence in whom is not less among the plant and appliance manufacturers of the industry than it is in the gas manufacturing section. In putting forward for consideration Mr. Helps's letter, and the scheme for a gas section delineated therein, we are not again going over the ground upon which there has been difference of opinion. That ground was constituted of considerations affecting finance, time (both in respect of duration and of season), and suitability of occasion in contrast with an *ad hoc* gas exhibition at some other time and place. The attitude taken up in this matter has, however, we think it may be claimed, had two excellent effects. On the one hand, it has opened the eyes of the gas-supply industry (Mr. Helps qualifies this with the words "to some extent," but the succeeding part of the letter is conclusive that "to the full" would have been a more appropriate expression) to the fact that, if gas exhibitions are to be held, they are not to be had to order without incurring financial responsibility; and on the other hand, it has produced a scheme (to be carried out by the Committee) that in its inchoate state holds out the hope of presenting those applications of gas that can be conveniently demonstrated in the summer months in a novel manner that will gain popular approval.

Having said this much, there are two or three points about the scheme that suggest comment; and if we in any way do not properly interpret Mr. Helps's communication, it is hoped that he will put the matter right in our next issue. It is seen that it is proposed that the indoor part of the gas section shall consist of a series of rooms, workshops, &c., all properly fitted to demonstrate the applications of gas for lighting, cooking, heating, and industrial purposes; and for this object the Committee have applied for some thousands of feet of space. Rows of benched stoves are not required, nor are stalls, from which are suspended and attached in all available space a medley of gas-fittings, which appear to have in their packed state no separate existence. But manufacturers are asked to help the Committee to make their scheme complete and effective by providing (in other words, loaning) the necessary goods, and bringing their experience to bear upon the show by the suggestion of novelty in application—for in novelty is attraction. The exhibition is to continue for six months; but, under the circumstances of the scheme, manufacturers' attendants will not be needed. The Committee will have their own representative and a bureau at the exhibition, where all information as to goods and appliances can be obtained by the public. Models showing the processes associated with gas manufacture will also be displayed. The scheme is a workable one, and if carried out on these lines bids fair to be popular. So far so good. In this particular part of the gas section, the manufacturers are only asked for two things—advice and the articles and apparatus required for equipment. About this, there should not be the slightest difficulty.

Now to carry out the "part" of the gas section so outlined, the intention of the Committee is to bear the entire expense. A generous "guarantee" fund has been raised in and around London; and an appeal is made to all gas undertakings to support the fund by contributions. We urge, and earnestly urge, all companies and committees who feel that benefit will accrue to the gas industry from the gas section to accord liberal support to the fund; for if the Committee cannot do the thing well, then better far will it be for the gas industry that the whole scheme should be dropped. Mr. Helps does not let us into the secret as to what the Committee estimate will be their financial requirements. "Thousands of feet of space," as Mr. Helps indefinitely puts the matter, are not, if our information as to the price per square foot is correct, going to be obtained without a heavy expenditure at the Franco-British Exhibition; and rooms and workshops cannot be erected and their equipment carried out for nothing. If the Earl's Court Exhibition cost the manufacturers a penny, it cost them an aggregate sum of £40,000 to £50,000; and this exhibition will cost several thousands if the thing is to be thoroughly well done. This year again several manufacturers have been spending substantial sums in exhibitions at Dublin and Manchester; and they cannot now be expected to directly financially support gas companies and committees in exhibiting at Shepherd's Bush. From the expense standpoint, the honour of financing must, it will be recognized, on this occasion fall upon other shoulders; and in saying this we emphasize the appeal of Mr. Helps to all gas companies and gas committees who are favourably inclined to the scheme to support the Committee readily and generously by substance as well as lip sympathy and approval. We write thus plainly on this question of finance because, in Mr. Helps's letter, there appears what manufacturing firms will regard as a suggestion that a scheme supplementary to the one already referred to should be considered by them. The Committee, observes Mr. Helps, believe that "they may look to manufacturers to seriously "consider whether they cannot, *by some approved scheme* "*which may commend itself to them*, support the efforts of the "Committee," &c.; and later on he says: "It will have "been gathered that the intention of the Committee is to "bear the entire expenses of that *part* of the exhibition "included in the above-outlined scheme." From what we have heard, the manufacturers are not likely to be moved to do anything at Shepherd's Bush other than support, by goods and suggestion, the scheme now outlined in our correspondent's letter. So far as this scheme is concerned (which very properly allows those who desire it to pay), hearty approval may be given to it; and we cordially hope that it will rise to an attractiveness that will produce for it the success desired by the best of its well-wishers.

Meanwhile it is noticed that an invitation to the London County Council to erect a pavilion to display objects of interest associated with the Metropolis does not meet the approval of the General Purposes Committee of the Council. They estimate the cost at £8000. They are not prepared to recommend the Council to adopt the proposal, and have so informed the Executive Committee of the Exhibition.

Coal Topics.

"SUFFICIENT unto the day is the evil thereof." Since the half-yearly meetings of the gas companies in August, little has been heard of the, during the contract period, absorbing topic of the cost of gas coal; but in most cases gas undertakings are now passing through a half year in which the gas sold will have been produced from coal that has cost, according to the prices paid under preceding contracts, anything between (say) 2s. 6d. and 4s. per ton in excess, and has added to the cost of manufacture (say) 3d. to 5d. per 1000 cubic feet, less the additional revenue from coke, which has been, in view of the high price of coal, maintaining a respectable value above the figures for the corresponding half year. The issue of the gas companies' financial statements at the end of January and during February will therefore be anticipated with peculiar interest, so as to ascertain what effect the

higher cost of coal has had upon the accounts, how far coke prices and dealings have come to the assistance of the gas undertakings, and whether those companies who have not increased the price of gas will be able to continue without taking that step. The prospect is that they will be in a position to do so, unless conditions undergo such a material change between now and the next contract season that coal owners will be sufficiently buoyed up to maintain, or ask for an advance upon, present figures.

Prophecy is not in our line. But there is liberty in opinion; and there is a fairly widespread opinion that the coal owners will, before long, have to ease prices down somewhat. Up to the present, they have kept fairly well to the figures at which gas coal contracts were last effected. Our Northern coal correspondent stated last week that prices then ranged from 12s. 6d. to 14s. 9d. per ton f.o.b. (this week 12s. 9d. to 14s. 6d.); and it is well within these extremes that quotations assemble from other authoritative quarters. The same correspondent last week made in a sentence a significant statement: "One sale of second-class gas coal [Durham] has "been made at about 12s. per ton f.o.b.; and that may in some "degree indicate the trend of prices." It is, however, quite in the nature of things that quoted prices should not change considerably in the lower direction while the pressure of the winter delivery of gas coal is on, which pressure the fogs and long dark days have not by any means tended to mitigate. But we are told there are certain collieries in Durham which are feeling the loss of quantities of coal they were wont to supply to the southern companies; and possibly those collieries will be very pleased, when next contract season comes round, to re-establish completely their whilom business connections. However, a comparison of present gas coal quotations and those ruling at this time last year indicates that the average difference is about 2s. 6d. per ton. But even now the views of sellers and buyers are diverging; and there appears to be ground why they should do so. There are places where, contracts not absorbing the full output, surplus production is not moving off readily. But this is put down to want of waggons, congested ports, and atmospherical abnormities. The excuse is wanting in subtlety, seeing that it is known there are buyers at a price. From most coal centres, too, it is reported that steam coals are not in any great request; and there is good presumptive evidence that exports will taper down a bit. The "Iron and Coal Trades Review," writing on our coal relations with Germany, tells us that "our market has beyond "question seen unprecedented prices under ordinary circum-"stances—for we have had no strikes or war—owing to the "pressure for coal from Germany; but there is nothing, in "view of the increasing German output, to prevent the fall-"ing off of our exports by 3 million tons next year, or of "their reverting, in fact, to the volume of exports of 1904 "or 1905." There will be joy in home industrial circles if this is so, as a decline in the demand from abroad must redound to the benefit of coal buyers in this country.

This year especially—next year more so—the Board of Trade returns bearing upon the world's coal production and destination are of interest. It is seen from those just issued (dealing with 1906) that the United States maintains the lead in the quantity of coal produced, the United Kingdom comes second, and Germany third. But while we hear so much from some quarters about the calamitous effects that the reimposition of a coal tax would have on this country's coal trade, which its original imposition (statistics stand to witness) with an admirable benevolence did not have, it is seen that America and Germany (between whom we are sandwiched as producers) suffer no ill-effects from having an export trade much less than ours. From our shores nearly 80 million tons of coal went to other countries last year; while Germany only had an excess of exports over imports (10,175,000 tons) of 15,600,000 tons, and the United States of only 8 million tons. There are many side-lights thrown upon coal questions by these amassed statistics—such, for example, as the fact that the output of coal in the United States *per capita* of the mining employees in the year was 560 tons; while in the United Kingdom, it was only 282 tons. The explanation is no doubt to be found in the greater practice of mechanical cutting in America.

But reverting to the question of exports, there has been an (though both wrote very seriously) amusing correspondence on the subject between Mr. J. Buckingham Pope and Sir George Livesey. Mr. Pope's original fantastic letter has appeared in several papers; so that it may be taken that Mr. Pope has a profound respect for his view of the matter. He states that a ton of coal exported from this country now brings into it 16s.; and this, calculated at 4 per cent. interest and compound interest, will, at the expiration of 500 years (!), amount to more than £260,000,000. And that figure would have to be multiplied by the 80 million tons exported last year; and the fresh business and its product must year by year be dealt with similarly and be added. The figures are really too majestic for any one to quarrel with them. But there is such a thing as living in a Fool's Paradise. The export of coal is no new thing; and applying Mr. Pope's calculation to the past, there have been a sufficient number of millions of tons of coal sent over the seas and through a sufficient number of years to have made, by automatic means, this country so rich that no one to-day ought to be contemplating a Government provided old-age pension, nor should there be any occasion for benevolent institutions. If an argument is required for the nationalization of the coal supply, Mr. Pope's letter (if anyone can take it seriously) furnishes it. We might have free everything if the coal was nationalized, and a ton of coal is so productive of wealth. After this, let there be no more talk of the hard times the coal owners have suffered; for Mr. Pope will be quoted against all such appeals for sympathy or all submissions of justification for an excessive enhancement of coal prices. Let us suggest to Mr. Pope that, during the continuance of the coal tax, there was an increase in the exports; and, in addition to the receipts of the coal owners for the exported coal, the nation was receiving 1s. per ton duty. On the 80 million tons last year, this 1s. per ton would have produced £4,000,000 in excess of what was yielded by the sale of the coal. Mr. Pope may calculate this out at 4 per cent. interest and compound interest, and add the result to that of his former quixotic exercise. This gentleman does not seem to appreciate that the collieries do not constitute the country or comprehend the whole of its industries, nor that the wealth of the nation is more adversely affected by what injures the whole of the industrial and human constituents of the fabric than by what injures only a part. When Mr. Pope recognizes this, he may well direct his energies to a comprehensive arithmetical computation of the cost to the country of excessively high-priced coal and increased cost of manufacture, and of their effects upon home consumers and competition with other countries, and set the combined result against his present workings—bearing in mind that the immediate past has given us an assurance that a coal export tax does not kill the export trade, though it may assist in steadying the demand. At this time, we need not think much of a remote posterity; sufficient it is to do the best possible for the living nation, and the best possible is not to be attained by an exorbitant price for coal, largely fixed by the requirements of other countries.

Gas and Ammonia from Peat.

At last the first step is being seriously taken in an attempt to profitably utilize a part of Ireland's tracts of peat. Anything that can be done that will improve the prosperity of the Emerald Isle must not have an ill-word breathed against it, even though the project is to bring two new competitors into the field for a section of the gas industry to meet. An electric power scheme for Dublin and Central Ireland is to come before Parliament next session; and the scheme embraces the obtaining of motive power for driving the electricity generating plant by gasifying peat, and recovering the ammonia and other valuable bye-products. The notice of the proposed Bill does not, of course, incorporate anything to serve as a guide to the possible measure of success to be realized; but judging from papers that have been written on the subject of the gasification of peat and the recovery of its other valuable constituents, it looks much as though the promoters of this particular scheme should be able to distribute electricity almost for nothing. That is merely how the matter appears on paper; but in practice, quite a different aspect might be given to results. Anyway, for the time being, we should look dubiously on the proposition; as neither gas power nor electricity power schemes have yet generally worked out to the satisfaction of those people who have put their faith in them, and with their faith a certain amount of money.

However, there is nothing like looking into the matter; for if Ireland's 2,830,000 acres of peat, of an average depth of 20 feet, can be profitably utilized, so much the better for Ireland. In April last year, Mr. Thomas Rigby, as was recorded in the "Journal" at the time, was advocating the use of peat for power purposes; and he and others who have

examined the question believe that, for this purpose, from the initial process of reducing the 90 per cent. of moisture in the peat to something less than 30 per cent. onward to the production of the gas, is a complete, practical, and commercial proposition. From figures quoted by Mr. Rigby, from others actually obtained during a recent trial of Italian peat at the Winnington works of Messrs. Brunner, Mond, and Co., and cited by Mr. T. Tomlinson before the Dublin Section of the Institution of Electrical Engineers, the dried peat contains 1 to 2 per cent. of nitrogen; and the sulphate of ammonia realizable is stated variously by authorities to be anything between 85 and 130 lbs. per ton of peat. In the Italian peat test at Winnington, when 650 tons of peat were gasified, 155 kilogrammes of ammonia, or 118 lbs. per ton, were obtained, with 1780 cubic metres of gas; and the Irish Peat Company, in a process they have at work at Kilberry, speak of other valuable products—acetate of lime, naphtha, paraffin, and volatile oils. Calculated from an analysis, 100 lbs. of dry peat contain 864,000 B.Th.U.; and of this 648,000 units are realizable as gas (the Mond trial gave 675,000 units). Assuming this gas to be used in a gas-engine with a thermal efficiency of 30 per cent., 194,000 B.Th.U. will be given as power (equal to 76 indicated horse power hours), and 454,000 B.Th.U. will appear as waste heat in the exhaust and cooling water. Theoretically everything looks well for practice working out right; but there happens to be one factor to success in connection with a power scheme of the kind, and that is custom. From the way previous estimates of probable custom have gone astray, it is safe to say that quantitatively this important factor is unknown in Dublin and Central Ireland.

Control of Gas Supply in America.

A MEASURE of control for companies conducting public services is—so long as the measure is not so large or imperfect that it becomes intolerable and even tyrannical, and impedes operating to the best advantage for the public and company—a good thing, for it encourages confidence and gives mutual protection. Naturally—and this is clearly put in an article in this issue, communicated by an esteemed American gas engineering correspondent on "The American "Gas Institute and its Work"—there is a little rebellious feeling against control on the part of companies in America who have enjoyed practically an unfettered liberty of action; but it is equally clear that recognition of the fact that there is mutual advantage to be gained from regulation is gaining ground in the United States, and those companies who are concerned in public service must accept what appears to be the inevitable, and be prepared for it. That was a point that was incidentally made in the article last week treating of the question of testing for the illuminating power of gas, and submitting the necessity of the American Gas Institute, through its Technical Committee, coming to some common understanding on the matter, and preferably to an understanding that would give support to the system of testing that has been evolved in this country at an enormous expenditure of time and money, and from an eventful experience. We advised preparation, and the acceptance of the support that this country can give from actual experience to this particular testing system, for the omens are that the day is surely coming when all the States will insist upon the gas-supply companies coming under control, but control that must for the common good be of a give-and-take order.

The gas-testing question is but a single and small one of the far-extending ramifications of legislative control as a revived general policy in the United States. If control is properly ordered, in addition to the defence of the public, it is helpful and confers status, power, and protection on supply companies; and it is in this light that it should be regarded. That is an experience of this country; and such status, power, and protection are regarded by the investing public on this side as valuable consideration in the matter of capital investment. Our correspondent suggests that America "has so far been a striking illustration of the truth "that greater benefit results to the people as a whole from "a system permitting undue rewards to capital than would ob-"tain under governmental control, accompanied by fixing of "prices too low to attract capital to public utility companies." Glancing over the instructive reports that have lately come from America bearing upon the commercial and financial latitude that has been permitted in the trading world of the United States, we have no hesitation in applying limitations to the truth contained in the first part of the quoted passage; and as to the latter part, so far as the gas industry of America is concerned, that is a matter that can be fully guarded against by the adaptation to American conditions of the sliding-scale as adopted in 1906, after a full investigation in this country, by the Gas and Electricity Commissioners of the State of Massachusetts, and introduced by the Boston Gas Company. But control imposed by this and the other existing Commissions upon gas-supply companies has not altogether brought satisfaction in the States concerned. In Massachusetts, a form of accounts has been prescribed that has not gained the approval of the whole of the gas industry; and the New York State Gas Commission have imposed illuminating power standards and a test that cannot to-day meet with any ardent acceptance on the part of sentient and prescient gas administrators and experts. These Gas Commissions are powers unto themselves; but the fault for disordered and onerous prescription cannot be entirely laid to their charge. The American gas industry was in a way unprepared for them; at one time, there was really no central organization of the administrative and executive men of the industry that in completeness could lay claim to be representative of the whole. In union there is strength; and in the American Institute of to-day power and representation have been centralized. We deem it therefore of the first importance that the Institute should address itself to the work of assembling together those conditions that would be acceptable in a system of control, and so be in readiness to support that system whenever and wherever State regulation springs into being. We are glad to see from the article communicated to our columns that a commencement has been made on such work; but let it be comprehensive.

Already there are Gas and Electricity Commissions in the States of New York, Massachusetts, and Wisconsin; and how soon Commissions in other States will be established cannot be said. The policy of the general control of *quasi*-monopoly concerns, once discussed in America as only an abstract proposition, has in some directions grown into a concrete necessity; and President Roosevelt's last annual message to Congress has only to be read to see that more effective control bulks largely in the political polemics of the near future. The pity of it all is that the necessity has been hastened into, and magnified in, public view by the jobbery, rapacity, and plunder rampant past and now in certain sections of America's commercial and financial world. But this we can conscientiously write, that, with the exception of events of some years ago in which Boston took an outstanding part, the gas industry of America has been kept clean, and purity and honesty have been of the qualities that even from afar have drawn admiration. But what has already happened shows that the American gas industry cannot longer hope for exemption from regulation. It has come, and will continue to come. But if the gas industry is to work out its destiny to the best advantage in the public interest, the lines of control must be discriminating; and we look hopefully to the American Gas Institute to utilize their opportunities and influence in making them so.

Co-operation of Yorkshire and Manchester Gas Associations.

The members of the Yorkshire Junior Gas Association had an interesting meeting at Leeds last Saturday, under the presidency of Mr. John H. Hill, who, as already announced in the "JOURNAL," has recently been appointed Secretary and Manager of the York United Gas Company. He therefore received the hearty congratulations of the members, to whom he delivered an address full of sound advice, mainly the result of his personal experience. Mr. Hill entered the service of the York Gas Company as a lad fresh from school, and is now at the head of their official and technical departments. It is not too much to attribute this capability of superintending both branches of the Company's business to acting upon the advice given to him at the outset of his career—viz., to dismiss from his mind the idea that his interests were confined to the books he had to keep in the office, and take in all the knowledge he could obtain in regard to what was going on upon the works. Mr. Hill confessed that he had profited by this advice; and therefore he passed it on to his hearers. He advised them to "know something about everything belonging to gas," until they had determined the lines along which their capabilities would lead them. He emphasized the importance of observation, followed by due reflection on what had been

observed. He pointed out that it was not enough to see coal put into a retort; the mind's eye must perceive the process of carbonization. Very much more which it will be useful for the Yorkshire Juniors to lay to heart they will find in the address of their President, who well deserved the thanks accorded to him for it. At the close of the subsequent complimentary remarks, the members discussed in private a proposal emanating from the Manchester District Institution of Gas Engineers, and referred to at the recent meeting in Liverpool, that the Institution should formally recognize the Manchester and Yorkshire Junior Associations, and bring all three into closer connection by giving the Presidents of the Associations seats upon the Council, and their President and Secretary joining the Councils of the Associations. As the result of a full discussion, a resolution was passed recording the appreciation by the members of the kindly attitude maintained towards the Association by the Institution, welcoming the movement towards official co-operation between the senior and junior organizations, and expressing willingness to agree to the proposals. The decision opens the way to intercommunication between the Associations named; and it may be hoped that the result will be beneficial all round. As far as the Yorkshire Association is concerned, the year upon which it has entered promises to be one of increased usefulness.

Gas Profits and the Rates at Belfast.

The generosity of the Belfast Gas Committee in the matter of contributions in aid of the rates, as well as in payment of the cost of the new City Hall, has for a long time past been on a princely scale; but at last, it seems, there is to be a tightening of the purse-strings. This is good news for the gas consumers, who have been called upon to bear, in the price charged for gas, so large a proportion of the burdens which should by rights have been distributed (if at all) over the whole of the ratepayers, as such. At a meeting of the City Council last week, Mr. J. A. Doran, who is the Chairman of the Gas Committee, drew attention to the matter in terms which left no possibility whatever of misunderstanding his meaning. There was, of course, nothing in his statements that has not been advanced before; but what he said was none the less effective on this account. The contribution by the gas undertaking of over £200,000 for public purposes, is certainly sufficient to justify his declaration that "it is absolutely unfair to take all the profits made from the gas consumers, and hand them over to the spending departments of the Corporation to do what they wish with them." The grant so far made for the year ending March, 1908, is, it seems, within a few thousand pounds of the amount that was paid in wages last year to the hundreds of the employees of the department; and this, it may be noted, includes a sum of £15,000 to pay off the balance of the cost of the new City Hall. Perhaps gas consumers will experience a thrill of pleasure whenever they see or think of this building—and perhaps not. The first reason given by Mr. Doran why it was impossible to continue the grants was that the price of materials had gone up. He might well have put his case upon a higher plane than this; but if he only meant that the price of gas would not be increased merely in order to maintain the profits at the present level, there is still something gained. The recognition of the "unfairness" of taking all the profits from the gas consumers, however, is a welcome one; and the fact that the grant of £15,000 just referred to for the City Hall was only carried by a majority of one vote by the Gas Committee, gives promise that, even when prices of materials again decline, the gas consumers may enjoy a bigger share of the prosperity of the undertaking than they would seem to have done in the past.

Administration or Contract.

What would otherwise have been a tame Local Government Board inquiry at Sheffield last week, was rendered quite exciting by the attitude taken up by the Inspector, Mr. F. H. Tulloch, on the question of the method to be employed for the execution of the work in respect of which it was desired to borrow money; and perhaps a little more importance than would otherwise attach to the matter is given to it by the assertion of the "Sheffield Independent" that the Inspector "had evidently received his cue from the Local Government Board." The first point arose in connection with some street improvements, which it was announced the Corporation intended to carry out themselves, and for which the Inspector asked whether the Council intended to engage a special staff or to employ their own regular workmen. After some little conversation, the Inspector expressed a desire to have a written statement by the Town Clerk as to the Council's intentions; and it was announced that the Chairman of the Committee concerned was willing to give a formal undertaking not to do the work with the permanent staff. A remark made by Mr. Tulloch showed that it was the matter of cost that was in his mind; and no doubt it was consideration of a like kind that gave rise to still more animated passages at a later stage of the inquiry. One of the sums the Corporation desired to borrow was for the carrying out of sewerage works in eleven streets, in continuation of a scheme for replacing defective sewers by more efficient ones. The Inspector asked how this was to be carried out and the reply was that the Corporation had a special staff of men on the work. This led Mr. Tulloch to exclaim that he could not understand why the Council never let contracts for these jobs—a remark which he followed up by strongly urging the desirability of letting at any rate the sewering of some of the streets out to a contractor, in view of the fact that it was a long time since the Corporation had entered into a contract with a private firm for this kind of work. On this a lengthy argument ensued; the Inspector adhering firmly to the position he had taken up, and the Town Clerk and the Chairman of the Highway and Sewerage Committee as stoutly maintaining the advantages of the Corporation carrying out the work themselves. Judging from the Inspector's remarks, he considered that the letting of a portion of the job to a contractor would form a useful check on the cost of similar work which the Corporation undertake themselves; but apparently the Council had no doubt whatever that the plan they are adopting is the best as well as the cheapest. In support of this view, the City Surveyor stated that in the past the Council had had some unfortunate experiences in the matter of letting such work by contract; and he urged that, to get the work done equally as well as they could do it themselves, the Corporation ought to pay much more to a contractor than it cost them, because they bought the material in enormous quantities, and thus had a right to assume that they got it as cheaply as a contractor could, or even cheaper. Seemingly the Inspector did not finally insist upon his point, but the discussion was withal an interesting one.

By the sudden death last Thursday, in his 49th year, of Mr. William Allison, eldest son of the late Mr. William Allison, of Louth, the local Gas Company have lost the fourth Chairman in as many years. Mr. Allison was appointed a Director in place of his late father; and he held several offices, and was greatly respected, in the town.

The late Mr. Simpson Rostron, one of the Directors of the South Metropolitan Gas Company, whose death was recorded in the "JOURNAL" for the 12th ult., left £159,046; and Mr. W. C. Waddington, the Superintendent of the Street Mains and Lighting Department of the Manchester Corporation, whose death was announced in the same issue, left £3995. Mr. John Mobberley, of Catherwell House, Stourbridge, Worcester, of Messrs. Mobberley and Perry, Limited, who died on the 14th of October last, aged 82 years, left estate of the gross value of £57,775, with net personalty sworn at £53,458.

The Institution of Mining and Metallurgy has drawn up a series of standard weights and measures with the object of securing uniformity in scientific papers. It has been decided that the word "ton" shall represent a weight of 2000 lbs. avoirdupois; and the word "gallon," the Imperial gallon measure of 10 lbs. of water. Temperatures are to be expressed in degrees Centigrade. Referring to this matter, "Nature" says it is to be feared that the use of the new ton of 2000 lbs. would, in the case of statistics of mineral production, not be so convenient as the statute ton of 2240 lbs. or the metric ton of 2204 lbs., both of which may legally be employed.

Though "dilapidations" is a subject which does not very closely concern the majority of gas managers, most of whose works and buildings stand on freehold land, their attention may be called to a book—"The Law of Building and Dilapidations"—which has just been published by Messrs. Eyre and Spottiswoode. The author is Mr. Ernest Todd, a barrister of the Inner Temple and the Western Circuit, who explains in his preface that the object of the book is to provide a practical guide to the law and procedure relating to building matters, more especially for the use of solicitors, architects, and builders. The text, which occupies 200 octavo pages, is followed by a vocabulary of building terms and several appendices filling about 330 pages more. They include forms of building contracts, leases, pleadings and precedents for actions and arbitrations, statutes, and bye-laws, &c.; and there are tables of statutes and cases bearing upon the subject. The price of the book is 15s.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 796.)

THE Stock Exchange last week, continuing on the lines of the welcome change inaugurated the week before, seemed resolved to take a roseate view of everything, and had quite a joyous time. Of course, when markets are in full rise, there comes the inevitable profit snatching. This operation was at times in action last week; but the upward movement was too strong to be long checked. The opening on Monday was very cheerful, and buying proceeded gaily, though the American Market was a little bit shy before the close. Tuesday was a very good day; everything being strong and buoyant. Consols were specially conspicuous. Wednesday was in a more cautious mood—being rather apprehensive of renewed gold demands for America; so that realizations became a feature, and prices in general were easier. But the sun was shining again on Thursday, and a recovery in prices was in full swing, though the failure of an American bank acted as a drag in that quarter. On Friday, there was a little more of the usual realizing; but the rising tendency overcame it—Home Rails and Americans being notably strong. Saturday was a very quiet day; but markets in general were firm, though those that had gained most the previous day lost a bit of their rise. In the Money Market, there was always an abundant supply to meet all demands for short loans; and rates became considerably easier. Discount rates were inclined to slacken until the prospect of an American demand arose, when they hardened; but on the removal of this cause of uneasiness, they again became easier. Business in the Gas Market was again on a scale no better than moderate; and it was not well distributed through the list—many issues being quite untouched. There was very little change made in the prices; but the most important were in the upward direction. Conspicuous in this respect was Gaslight and Coke ordinary, which advanced another point, with transactions which ranged from 93¾ to 94¼. A fair amount was done in the secured issues; the maximum changing hands at from 86½ to 87¼; the preference at from 101 to 102½; and the debenture at 82 and 83. South Metropolitan was not very active. It was, however, very steady at from 120 to 121. The debenture was done at from 81¾ to 82⅛. Commercials were very quiet, with a few transactions in the 4 per cent. at 103 and 104; and in the 3½ per cent. at 99 and 99½. In the Suburban and Provincial group, British made an advance, and realized 39¼ and 39⅝. This was all that was done in London. On the local Exchange, Newcastle was fractionally easier. In the Continental Companies, Imperial was unaltered, changing hands at from 167 to 169½. European fully-paid was done at 22½, ditto part-paid at from 16¾ to 17⅛, and Union at from 110 to 111⅛ (a fall of 1 in the quotation). Cagliari fell ½, and was done at 26. Among the undertakings of the remoter world, Bombay realized 6½, Hong Kong 19⅛, Oriental 136½, Melbourne 5 per cent. 100 and 100½, ditto 4½ per cent. 101⅜, Monte Video 10½, Primitiva 6½, ditto preference from 4⅞ to 5 1/16, ditto debenture from 92 to 93½, River Plate from 13 1/16 to 13¼, ditto debenture from 92⅜ to 93, and San Paulo 13⅜ and 13 5/16.

ELECTRIC LIGHTING MEMORANDA.

The Legislative Programme—London Again—An Old Complaint without any Foundation in Fact—Nationalization of Electricity Supply—Nemesis—Anticipating Loan Sanctions—An Unreasonable Casting of Bread upon the Waters.

THE electrical industry like the gas industry contributes a small quota to the legislative programme for next session of Parliament. The number of Electricity Supply Bills and Provisional Orders is light; and, in the matter of importance, we should say the Electric Traction Bills of the session will outweigh the ordinary supply measures. Among the notices of Electricity Bills is a big scheme referring to London, which appears to be a bit vague in outline. It is proposed to form a Joint Committee, comprising representatives of the Companies supplying electricity in London, and to authorize the transfer and vesting in this Joint Committee of the present stations of any of the London companies or local authorities supplying electrical energy within the Administrative County of London, and to build new stations. It will be surprising if a measure promoted by the Companies meets with the approval of the present Government; but the London County Council went as far as they cared to go last session, and, the Council not making a move for the coming session, the Companies are doing the right thing in seeing whether they can put the electric supply of London in a secure position without injuring existing interests. To satisfy the craving for municipal control of a number of members of the present Parliament, it is proposed that the London County Council and, on certain conditions, local authorities shall be represented on the new body. The Joint Committee naturally desire to be exempt from the provisions of the Electric Lighting Acts of 1882 and 1888 in regard to purchase; and they propose to make their operations take a respectable sweep—the Administrative County of London, and part of Essex, Kent, and Surrey coming within their plans. Those at the bottom of this proposed Joint Committee mean very serious business; for they will desire that obligations should be imposed upon any of the London Electrical Supply Companies with respect to the sale by them of all or any part or parts of their undertakings, and upon any local authorities supplying electrical energy within the Administrative County of London. The two prominent favourable features about the scheme are that it would really injure nobody's interests, and that (if there is anything in the concentration of generating plant) concentration would be eventually brought about. The former remark could not be made about schemes that have been discussed in recent sessions. But this Joint Committee Bill does not stand alone. Another measure is going to be introduced in the hope that it will result in a company being established with powers to purchase and build works, and supply electricity, in the Administrative County of London, and portions of Middlesex, Essex, Kent, and Surrey.

An old figure on the electrical stage—that of Mr. Robert Hammond—has again burst into view. He has been giving the students of the Institution of Electrical Engineers what is described by an electrical contemporary as a most useful historical summary of the various legislative sins of which Parliament has been guilty in connection with electricity supply. We do not know much of what Mr. Hammond's address consisted, as his exercise does not appear to have been worthy of extended notice by those electrical papers that have come under our notice. But as to the legislative sins, the professionals of the electrical industry—purely, we imagine, for the sake of having something or someone to grumble at—are always complaining about what the Legislature has or has not done for electricity supply. The electrical industry should place its freedom alongside the restriction which has been imposed on the gas industry; and then it would be found that things are not so bad as it is fancied they are. Of legislative sins, there are certain which could be named, and which might be called sins of inequality, through and by which favour has been accorded the electrical industry to the disadvantage of the gas industry in business competition. In a comment on Mr. Hammond's address in our contemporary, there is a sentence which reads: "It is desirable to arrest the injudicious action of those authorities who oppose electrical progress because they have already risked ratepayers' money in gas-works." The absurdity of this can be found by comparing the towns where municipal gas works and electricity works exist. It is seen how largely those towns that had tasted the sweets of having in their possession profitable gas-works, purchased years ago, were anxious that they too should have whatever could be obtained from also running electricity works. And many of those municipalities now regret that their wish did not perish in its infancy. So far from local authorities having been antagonistic to electric lighting, they have favoured it all too much. The last available figures inform us that there are 258 local authorities owning electricity undertakings, and 270 owning gas-works. How does this support the remark in our contemporary? The complete available figures relating to both classes of undertakings all refer to the year ending March, 1906. In that year the 217 municipal electricity undertakings that had been working twelve months or more (excluding Marylebone) had charged to capital £32,929,734; while the 270 municipal gas undertakings had borrowed £39,401,896, and repaid £10,858,224. Notwithstanding this closeness in the amount of capital employed, the gas undertakings made a net profit of £798,210, against a profit of £478,675 by 143 local authority electricity undertakings, and a loss of £82,161 by 74 undertakings. On consideration of these figures, it is difficult to see there has been any risk of ratepayers' money in gas-works, but it is easy to see there has been considerable risk, and a very small average percentage of profit, attaching to the investment by the local authorities in electricity supply. We should therefore dearly like to have expounded the sentence: "It is desirable to arrest the injudicious action of those authorities who oppose electrical progress because they have risked ratepayers' money in gas-works."

There have been certain surprises lately from Germany in the nature of revelations as to financial embarrassments; but there are quite near at hand means for a happy issue from all financial afflictions. It lies simply in the nationalization of the generation and distribution of electricity—that at any rate is what is said in the "Magdeburger Zeitung" in an article that has been noticed throughout the newspaper world. Electricity is destined to fill the glorious position, for which we have been fondly hoping gas was the chosen, of being the most important factor in the whole industrial system. It is believed the Imperial Government ought to distribute electrical energy; and it is prophesied this would result in something more than financial reform. Big profits for the Government on the one hand; and, on the other, employees would have more pay and pensions, and consumers would have current at lower rates. How these opposing ends are to be attained is not yet explained; but the experience of municipal monopoly in electricity supply where it exists in this country, does not include such a financial harvest that we can bring ourselves to look upon nationalization of the business as a safe venture—let alone put any belief in all the wondrous blessings that the schemer in this instance has conjured up. Against this nationalization scheme, municipalization projects in this country look petty and silly. But we would have them so rather than go to this seriously presented extreme in communistic ideals.

It is not a comfortable reflection for electricity users that the electric current plays its most distinguished pranks more frequently in the winter than at any other time. Certain instances

of lapses from continuity of service were noticed in the "Memoranda" last week; and a rather interesting one has since come under notice. A few months ago ("JOURNAL" Oct. 1, p. 19) criticism was made of a pamphlet prepared by Mr. Napier Prentice, the Engineer of the Felixstowe Electric Supply Company, in which pamphlet electricity was lauded to the skies. Never was anything like electricity—that is to say, according to the 'prentice hand at drawing up persuasive literature for householders and others. However, there was one important thing left out of the pamphlet, and that was the question of the want of reliability in service of the electric current. Of course, that was a slip on Mr. Prentice's part. But the omission has been rectified by an object-lesson in Felixstowe and paragraphs in the "East Anglian Daily Times." A few days ago we read in that paper: "During the past week the electric light at Felixstowe has been most unsatisfactory, and considerable inconvenience has been caused to shopkeepers and residents. Notwithstanding that the arc lamps on the Promenade have not been lit for several nights, the power has not given sufficient light for the shopkeepers and householders, so that lamps, gas, or candles have had to be requisitioned. The culminating point was reached on Saturday evening, when the light sank to a faint glimmer throughout the town; and the inhabitants had to depend entirely on lamps, gas, or candles. A breakdown at the works is given as the reason for the unsatisfactory state of things that has prevailed for the past week or so." After this, we read that 38 tradesmen—who "had suffered great inconvenience and loss of business by the frequent failure and general unreliability of the electricity supply"—had petitioned the District Council to use their efforts to force the Company to employ methods which would prevent a recurrence of the nuisance." The pretty things Mr. Prentice wrote recently about gas will have occurred to him in his hour of tribulation.

Electricity Departments and local authorities themselves are very slow learning what they ought, and what they ought not to do, to conform with the rules of the Local Government Board in respect of borrowings. It might have been expected that the Liverpool Corporation would have known better, even if the Surbiton District Council did not, that the Board object to contracts being entered into before applications for loans are made and sanctioned; they also object to the granting of loans for prospective expenditure a long way ahead. The attitude of the Board in this matter is quite a legitimate and reasonable one—their functions being both supervisory and protectoral; and if they were not strict in these matters, their work would be futile and farcical. The Liverpool Corporation have sinned before in this matter of entering into contracts before procuring permission of the Board to a loan; and they have sinned again, and the Inspector at the inquiry into an application for £200,000 for electricity purposes (Mr. H. Ross Hooper) has remonstrated with the representatives of the Corporation on the subject. The excuse is that the business comes with such surprise avalanches that the department cannot wait. But this excuse is rather spoilt by knowledge that a couple of Westinghouse turbines included in a loan of 1904 are still in the hands of the contractors. We do not say the Liverpool Electricity Department has not had a considerable amount of success (so has the Liverpool Gas Company, as the articles appearing in the "JOURNAL" last week will have shown readers); but the Electricity Department cannot be so short-sighted that it is impossible to satisfy the Local Government Board by doing the proper thing. One point at the Liverpool inquiry was an expression of Mr. Hooper's opinion, which no doubt represents that of the Board, that electricity meters should be purchased out of revenue, and not out of capital. It may be expected that, when the sanction of the Board is received at Liverpool, it will be found that something very considerable has been knocked off the £200,000.

As to the inquiry at Surbiton, the District Council's officials and all those connected with the capital-spending department, are having an exciting time of it. Mr. Hooper has found it necessary to go down to Surbiton twice over the application for a further loan of £20,000, which has now been reduced to £17,700 or £14,000 at the discretion of the Board, and still the inquiry is unfinished. At the second day's hearing, it was found that the Council have—apparently stimulated to action by the wishes of Callender's Cable Construction Company, Limited—been treating too literally the enjoinder to "cast your bread on the waters, and it shall return to you after many days;" for it was shown that they have been casting cables (costing decent sums of money) into roads in which they have only been able to obtain one or two electricity consumers, and from those roads it will be very many days (perhaps never) before there will be any sufficient return on the money sunk in them in the shape of cables. The metaphor is very beautiful and all right up to a point; but in business, and when dealing with ratepayers' money, its application should be guided by reason. In this case, again, the Inspector had to take exception to excess expenditure; and he also protested against items being charged to capital which do not produce revenue. Incorrectness of statement, and absence of figures and adequate explanation, caused the inquiry to be adjourned *sine die*. Touching the question of prepayment meters for electricity supply—a subject to which allusion was made quite recently (*ante* p. 546) in an editorial article—Mr. Stevenson, of Messrs. Talbot and Stevenson, the Consulting Engineers to the Surbiton authority, stated, during the inquiry proceedings, that personally he did not think such supply was worth troubling about; and this is a growing belief of station engineers.

THE GAS SECTION AT THE FRANCO-BRITISH EXHIBITION, 1908.

WE have received the following communication from Mr. James W. Helps, and are glad to hear the determination that has been arrived at by the Committee for whom he is acting as Honorary Secretary.

An influential Committee, with Mr. H. E. Jones as Chairman, have had under their consideration for some little time past the question of the part to be taken in the Franco-British Exhibition by the Gas Engineering Section; and I beg, on their behalf and with your permission, to lay before your readers some particulars as to the decisions at which they have arrived.

In the first place they have come to the conclusion that the exhibition, which is likely to attract thousands of visitors from all parts of the British Empire, is emphatically the place at which to show the progress which has been made in the various methods of using gas and of bringing prominently before the public the most improved means of utilizing it for domestic, industrial, and commercial purposes—especially as they know, from experience gained at other large exhibitions (such as those held within the last few years at Paris, Brussels, Liége, &c.), that the Engineering Section, in a prominent portion of which the Gas Section at Shepherd's Bush will be housed, has always proved one of the greatest centres of attraction to visitors generally. They think this fact should indicate to manufacturers that such an exhibition as is now proposed does offer an excellent opportunity of bringing before an interested public the various appliances with which they more particularly deal.

The Committee appreciate to some extent the attitude assumed with regard to the question as to the share of expenses which should be borne by gas companies, who are more particularly interested in the sale of gas and its accompanying products; and fully recognizing as they do the great importance of practical advertisement from the gas companies' point of view, they have now formulated the outline of a scheme which they believe will commend itself to the gas industry generally.

They do not believe it possible that anyone will question the advisability of making every effort to secure for the gas industry a share in the lighting of the grounds and buildings of the exhibition; and they are glad to say that, through the enterprise and activity of two of the leading London Gas Companies, early steps were taken to secure a prominent position for the outdoor lighting. With regard to the interior lighting, which is, if anything, still more important, there has been considerable difficulty, as the organizers of the exhibition have already largely committed themselves to the electricians. The Committee have, however, obtained a promise that, notwithstanding the arrangement made for wiring the buildings, &c., they shall be entrusted with the whole of the lighting of their own part of the building, and also probably with that of a further portion. Naturally, however, the amount of lighting entrusted to them must, to some extent, depend upon the character of the show made by their section; and this emphasizes the necessity for all possible efforts being made to ensure that the display made by the section shall be large and as attractive as possible.

Now, in order to meet the above-mentioned point, the Committee have applied for some thousands of feet of space, which they propose to arrange as a series of rooms, workshops, &c., all to be furnished and fitted up so as to show to the best advantage the most improved and most modern appliances for utilizing gas for lighting, cooking, and heating purposes, and for its application to the many industrial operations to which it has been successfully applied in various parts of the country. To make the exhibition as attractive as possible to visitors, the various apparatus will, wherever practicable, be shown in operation, and actively employed in performing the work for which it was designed. The idea of the Committee is not so much to exhibit numerous articles similar with regard to their general principles, and differing only in certain details of arrangement and shape, but rather to practically illustrate the principles involved in their use, by showing in action the best examples of the apparatus used in the particular industry dealt with or for the special purpose desired. It is not intended that the articles and apparatus should be specially labelled with the names of the makers; but a bureau will be established in a prominent position, at which all necessary information with regard to them can be obtained.

The Committee also propose to exhibit a collection of models, drawings, photographs, &c., illustrative of the progress which has been made of late years in connection with the processes involved in the manufacture and subsequent treatment of gas and its production, also the improvements made in those mechanical appliances which have so greatly aided such progress.

The above gives, as has been said before, merely an outline of the proposed scheme, which will be developed as time proceeds. It is hardly necessary for the Committee to say how heartily they will welcome any suggestions from the manufacturers, as they fully recognize that it is only by the combined experience of those who produce the articles which render the numerous uses of gas most valuable, as well as of those whose inventions and efforts cheapen production, that successful results can be obtained.

And now having sketched the proposals of the Committee, it is necessary to deal with the important question of "Ways and

Means;" and it is with some satisfaction that the Committee are in a position to state that, through the public-spirited and generous action of a few of the Gas Companies in and around London, a guarantee fund has been raised, which, while not providing all the necessary means, does to a great extent reassure the Committee on this very important point—especially as they feel confident that, when their objects and intentions are made known, many other companies in all parts of the country will be ready and willing to assist with their contributions the efforts of those responsible for carrying out the scheme.

It has been sometimes urged that an exhibition held in a particular district is calculated to benefit only those companies doing business in or near the selected locality. Such, however, is really far from being the case; for not only do people from all parts of the country visit the exhibition, and take back to their particular towns information which spreads and thereby results in an increase of business to the local company, but the broader principle must be accepted that any efforts made to bring about improved methods of dealing with gas, and of bringing such methods to the knowledge of the public, cannot in their effects be confined to any particular company, or group of companies, but must of necessity affect the gas industry generally. Of course the words "gas industry" include manufacturers as well as gas companies; and any success or additional business which accrues to gas companies through the means mentioned, must reflect on the business prosperity of manufacturing firms. It is this fact that leads the Committee to believe that they may look to manufacturers to seriously consider whether they cannot, by some approved scheme which may commend itself to them, support the efforts of the Committee, and so render the proposed venture not the least attractive section of the great Franco-British Exhibition to be held at Shepherd's Bush next year.

It will have already been gathered that the intention of the Committee is to bear the entire expenses of that part of the exhibition included in the above outlined scheme; and they venture to express the hope that many companies will show their appreciation of their efforts in the direction of presenting to the public an attractive and instructive demonstration of the many directions in which the commodities they offer can be profitably employed, by contributing to the fund which is being raised to meet the necessary expenses.

Signed, on behalf of the Committee,

J. W. HELPS, Honorary Secretary.

Waddon, Croydon, Dec. 5, 1907.

THE CONTINENTAL UNION INVESTIGATION INTO THE DESSAU VERTICAL RETORTS.

The Question of Illuminating Power.

THE article in last week's "JOURNAL" on the inquiry by Engineers of the Compagnie L' Union des Gaz (which trials were carried out under the superintendence of M. Freyss, of the Union des Gaz, Paris) into the working of the vertical retorts at the Dessau and the Berlin (Oberspree) Gas-Works, furnished a very interesting contribution to the general subject; and from communications received, it has been read with avidity in many quarters. Herr E. Körting, however, the Chief Engineer of the Berlin Works of the Imperial Continental Gas Association, thinks that the illuminating power results have perhaps been a little obscured by quoting the French illuminating power standard only; and he forwards the following table to render the point clear:—

Trials made in Dessau (4 metre Retorts) by the Engineers of the Union des Gaz.

Coal.	Production of Gas.		Illum. Power "London" Argand No. 1 Burner 5 Cub. Ft.	Heating Power. B.Th.U.
	Per Retort and Day. Cub. Ft.	Per English Ton of Coal (1015 Kilos) Cub. Ft.		
Boldon—				
Without steam . . .	13,243	11,513	18·1	626
Leverson's wallsend—				
Without steam . . .	13,420	11,480	16·8	613
With steam . . .	14,480	12,540	14·8	575

Remark: Gas corrected to 29·922 mm. bar., 59° Celsius.

It will be observed that the final table in last week's article deals with the results that M. Freyss and his colleagues obtained at Dessau only with Boldon coal without steam. Regarding that table, we fail to see that any error has been committed in the conversion to cubic feet per ton of the figures referring to production. The average results obtained by the investigators on three days were 10,700, 10,983, and again 10,983 cubic feet; whereas Herr Körting states the make at 11,513 cubic feet. The question arises as to whether the same set of figures is being dealt with. Then with reference to the illuminating power, we stated the results in the form which complies with the obligation in this matter of the Union des Gaz, which is that not less than a carcel (9·6 candles) must be yielded by the consumption of 105 litres of gas (about 3·7 cubic feet). We know that, using a "London" No. 1 argand burner there is no proportional relation between consumption and illuminating power—that is to say, a gas yielding 9·6 candles per 3½ cubic feet would yield considerably more than a proportional increase of illuminating power by the consumption of an additional 1½ cubic feet. Mr. A. G. Vernon Harcourt made this clear in a discussion at the February meeting of the Southern District Association of Gas Engineers in 1890; Sir George Livesey did the same in his evidence, in the House of Commons, on the South Metropolitan Bill, March, 1902; and other observers have done the same in connection with the fight in London over the testing question. Not knowing the burner used and the conditions under which the gas was tested at Dessau which resulted in obtaining, by the consumption of 3·7 or 3·6 cubic feet of gas, an illuminating power of 9·6 candles, we cannot discuss the point as to the realization of nearly twice that illuminating power—that is to say, 18·1 candles—by the consumption of 5 cubic feet in the "London" No. 1 argand burner. Any way, the difference suggests that, to give full justice to gas, the methods of Continental gas testing require revision; and certainly we have here another argument in support of a universal system of gas testing, for thereby much misunderstanding would be avoided. On this question of illuminating power, it may be recalled to mind that in Herr Körting's paper before the Institution of Gas Engineers in 1906, he stated that he had (in a fortnightly trial) with Boldon coal without the admission of steam obtained 11,700 cubic feet of gas per ton, of an illuminating power of 13·5 candles; and when steam was admitted, the make was increased to 13,250 cubic feet per ton, but the illuminating power was reduced to 11 candles. These figures, we believe, were the results of tests with the 5-metre length of retorts. Looking at the 18·1 candles now quoted (4·6 candles difference), there appears to be good ground for congratulation on a marked improvement in result (using the 4-metre retort) from the point of view of the gas-maker working to an illuminating power standard with a penalty attached for deficiency.

There is no question that we have arrived at a position now when figures require to be reconciled and further explanations given in the interests of that progress which Herr Körting and his colleagues have as greatly at heart as the best of gas practitioners in this country. For instance, our respected correspondent does not explain a matter of considerable technical interest—the reasons for the differences in the results of carbonizing in 5-metre and 4-metre length retorts, as reported upon by the Engineers of the Union des Gaz.

The Dispersal of Fog by Gas.

Readers may remember that the London County Council recently had before them a report by the Public Control Committee on the subject of an apparatus invented by M. Demetrius Maggiora for the dispersal of fog by means of discharges of gas. No action was taken upon the report, as the matter was under the consideration of the Director of the Meterological Office (Dr. W. N. Shaw), who purposed advising the Committee as to the suitability of the apparatus for the atmosphere of London. Dr. Shaw has made his report, and it will come before the Council at their meeting to-day. He says that Signor Maggiora's invention "once more raises the whole question of the possibility of affecting the weather by artificial means, which, whenever it has been investigated by competent authorities, has been decided in the negative, except in the special case of the lightning conductor." The process of bombardment, which is the essential point of the invention, has been recommended with similar confidence as a means of causing rain. After reviewing Signor Maggiora's claims in regard to the prevention of hailstorms, and quoting Professor Pernter, the Director of the Austrian Meteorological Office, as to the ineffectiveness of rockets and bombs in what he expressively calls "weather shooting," Dr. Shaw says that "no further expenditure upon the artifical modification of weather in the form of hailstorms can be justified on scientific grounds." As the apparatus offered by Signor Maggiora for removing London fog is apparently on similar lines to those supplied for dispersing hailstorms, Dr. Shaw's remarks are equally applicable in this case. He points out that the weight of a cubic mile of air is about 5 million tons, and that the weight of fog-laden air in the case of a fog a mile thick, extending over the district of Greater London alone, would be 3000 million tons. It is, therefore, he says, "obviously useless to attempt the motion of so great a mass by mechanical action." Having regard to the terms of Dr. Shaw's report, the Committee do not feel justified in recommending the Council to expend money in connection with experiments with the apparatus in question; but they think the inventor should be afforded facilities to undertake them at his own expense. They therefore recommend the Council to authorize the Main Drainage Committee to allow Signor Maggiora to use a site, on land held for main drainage purposes, for conducting experiments with his apparatus.

At the meeting of the London County Council last Tuesday, the recommendations of the Establishment Committee in regard to filling the vacancies in the Chemical and Gas-Testing Department, to which reference was made under the "Personal" heading in the "JOURNAL" last week, were approved.

PERSONAL.

The Barry Urban District Council, at a special meeting last Friday night, appointed Mr. T. E. FRANKLIN as their Gas and Water Engineer, at a commencing salary of £350 a year. Mr. Franklin at present occupies a similar position at Goole. The proceedings which had culminated in the amalgamation of the management of the two undertakings, and the superseding of the present Managers at Barry, have been from time to time recorded in the "JOURNAL."

At the meeting of the Birmingham City Council last Tuesday, a letter was read from Mr. E. ORFORD SMITH, the Town Clerk, formally resigning his position on account of ill-health. The Lord Mayor (Mr. H. J. Sayer), in bringing the matter before the Council, referred in eulogistic terms to the work of Mr. Smith. He said he came to Birmingham when the city had arrived at the developing stage, and it had taken up large schemes which had to be carried on, while others had to be developed. During the whole of the time Mr. Smith had been with them, he had conducted the legal work of his department with consummate skill and ability. He (the Lord Mayor) was sure that Mr. Smith would carry with him into his well-earned retirement the grateful thanks of the Council, and the sincere desire that he would be restored to health to end his days in peace and repose. He concluded by moving—"That this Council, in receiving the resignation of Mr. Edward Orford Smith, the Town Clerk of this city for over twenty-six years, desire to record their high appreciation of the ability, fidelity, courtesy, and zeal with which he has discharged the important duties of his office during so long a period, to the great advantage of the Council and of the city; and to assure him of their sincere sympathy with him in his continued illness, and their earnest hope that his retirement and freedom from the cares of office may conduce to his speedy and complete recovery." Alderman Baker said that he seconded the motion with great regret, because the Corporation were losing the services of an excellent official. It was decided to advertise for a successor, and to add four to the number of Mr. Smith's completed years of service, which would entitle him to the maximum retiring allowance of one-half his salary—viz., £1000 per annum.

CASSIER'S "GAS-POWER" NUMBER.

THE gas-power number of "Cassier's Magazine," just published, is as its name indicates devoted to the various uses of gases for the development of power. Gas power, as found in practice by the gas engineer, is practically excluded from the contents of this number, which is monopolized by subjects such as the utilization of waste gases of blast-furnaces and coke-ovens, the various types of producer plants for the manufacture of low-grade gases, the development of the large gas-engine, and other similar subjects—all interesting in their way.

One interesting article on the "Bye-Product Recovery Gas Producer Plants," by Mr. H. A. Humphrey describes the well-known Mond process, with its ingenious and well-planned method of working. A historical review of the development of the internal combustion engine by Mr. H. H. Suplee, takes us through the story of the gradual evolution and improvement of the gas-engine. Even so long ago as 1800 the correct principles, according to modern ideas, were beginning to be understood. Lebon patented a two-cycle engine in which the gas and air were compressed, the ignition being effected by an electric spark. But it was not till 1860 that a practical gas-engine was produced. This engine, invented by Lenoir, was built up on very similar lines to the steam-engine of that time; being fitted with slide valves operated by eccentrics attached to the crank shaft, by which means the explosive mixture was admitted alternately at each end of the cylinder. There was undoubtedly at the time a demand for such a machine, for about 500 engines were made during the five years following the date of his patent. In 1866, Otto and Langen produced a vacuum gas-engine; the principle being to generate power by exploding a mixture of gas and air and the subsequent contraction of the products of combustion. This principle had been attempted at an earlier date, but without any pronounced success.

Otto and Langen's engine came into commercial use for a number of purposes, and was sufficiently efficient to show a gas consumption of 44 cubic feet per horse power per hour, as compared with 100 cubic feet in the Lenoir engines. In 1878, Otto brought out an entirely new type of engine, constructed on the four-cycle principle, which may be said to be the commencement of a new era of the internal-combustion engine. It speaks volumes for the efficiency of this engine that now, after nearly thirty years, types of the engine may still be seen running in a satisfactory manner. From this time the "Otto" engine had a virtual monopoly of the gas-engine demands till the expiration of the patent in 1890. It should be mentioned, however, that an equally efficient two-cycle gas-engine was brought out by Mr. Dugald Clerk in 1880; and, as is well known, much of the success in the development of the gas-engine since that time has been due to the work of this able engineer.

During the last twenty years much time has been spent in the adaptation of producer and suction-gas plants to the use of various low-grade fuels, many of which would be quite unsuitable for use under boilers, owing to the low percentage of heat units contained. Siemens and Dowson were pioneers in the development of producer-gas plants; while Benoit, a Frenchman, first introduced the suction-gas plant, which has since been so extensively adopted. It seems almost incredible that before 1894—many years after the introduction of the "Otto" gas-engine—the enormous production of blast-furnace gas was allowed to go to waste. To satisfactorily comprehend the extent of this waste, it should be mentioned that no less than 480 available horse power may be utilized for every ton of pig-iron produced per hour; and when it is stated that the output for 1906 from this country alone amounted to the enormous figure of over 10 million tons, it will be realized how great will be the economy when the utilization of all this blast-furnace gas has become general practice. This is the gist of an authoritative article by Mr. B. H. Thwaite, who is the discoverer of the adaptability of blast-furnace gases for motive power in gas-engines. Before the year mentioned, the usual practice had been to burn this gas for steam-raising purposes, from which the power was obtained to drive the blowing-engines and mills. But it was found that the efficiency resulting from this procedure was very small, and was only about one-third to one-half that obtained by the direct use of the gas in gas-engines.

One can easily credit this when the much superior efficiency of gas-engines as compared with steam-engines is taken into account. In actual practice it has been found that a large double-acting four-cycle tandem gas-engine requires the consumption of 2355 calories to develop an effective horse-power; but as the gas before being used must be freed from dust, which in blast-furnace practice is carried out by a mechanical washer, it has been ascertained that 2500 calories are required to include the power needed to drive the washer. As opposed to this, it has been found by the same authority, M. Leon Greiner, the Chief Engineer of the great John Cockerill works, near Liége, Belgium, that for steam-engines or steam-turbines, operated with good boilers, superheaters, re-heaters, and all the modern requirements, a consumption of not less than 6000 calories is required. "The conclusion follows that, given a certain quantity of gas, its direct utilization in the internal-combustion engine permits the development of two-and-a-half times the amount of power which can be obtained from steam-turbines or reciprocating engines of the most economical kind if the gas is burned under steam-boilers."

The investigations of the United States Geological Survey have recently led to some remarkable results in the utilization of low-grade fuels, such as soft coals, lignites, bone coals, and even peats for gas-producer work. An interesting article by Mr. C. T. Wilkinson, based on these tests, discloses the fact that the use of low-grade fuels in gas-producers, and the resulting gas used in gas-engines, will generate, as was found in the case of blast-furnace gas, about two-and-a-half times more power than if it were burnt for steam raising. Mr. Wilkinson quotes a number of experiments in which a variety of low-grade fuels are tested for their respective efficiencies in boilers and producers; the steam and gas thus produced being consumed in modern engines. These coals would be considered of little value for steaming and yet give a good account of themselves in the gas-producer, which, as the author shows, opens up a field for the development of mining properties which are now considered worthless. The tests are sufficiently interesting to warrant the reproduction of a portion of the figures:

Fuel.	B.Th.U.	"Steaming" Test per Electrical Horse Power. Lbs.	"Gas" Test per Electrical Horse Power. Lbs.	B.Th.U. per Cubic Feet.	Gas per Ton. Cubic Feet.	Carbon + Volatile Matter. Per Cent.
Dakota low-grade coal	7,069	8·46	3·10	159	58,000	58
Texas lignite	7,348	..	2·47	156	76,000	59
Florida peat	10,882	6·98	2·85	175	67,000	74
Bone coal	8,566	..	..	144	98,000	55
Virginia steaming coal	14,436	3·45	1·04	139	224,000	93

The last-named is a recognized steaming coal, which is included for purposes of comparison.

One cannot read about the Mond process of gas and ammonia production without wondering whether the relatively enormous yield of ammonia—90 lbs. of sulphate per ton of coal—obtained by this system cannot be similarly reproduced in some measure in the present methods of manufacturing coal gas. Let us consider for a moment how this desirable state of affairs is brought about in the Mond system. The ordinary cheap fuel used in bye-product recovery gas-producers contains about 1·3 per cent. by weight of nitrogen, of which all cannot be extracted in the desired form; but about 70 per cent. is recoverable if proper precautions are taken. In the ordinary producers in which coal is used, the temperature may be anything between 700° and 1000° C., while in the bye-product producer it is about 450° C. It has been found that the most practical way to increase the yield of ammonia is to introduce with the air-blast large quantities of steam. No less than 2¼ tons of steam enter a producer per ton of coal

gasified; and it has been ascertained that up to this quantity the yield of ammonia increases with increase of steam.

The production of this steam is obtained in a most ingenious and economical manner. The air-blast is the source by which much of the necessary steam is introduced. The cold air is blown into the air-heating tower, which is a vessel closely packed with tiles, by which means the descending hot water is caused to spread over a large area. The air ascending absorbs much of the vaporized heat, and having reached the top of the vessel becomes saturated with water vapour, and is in a suitably heated condition for entering the producer. Cold water likewise enters the top of a similarly constructed vessel, and, descending, meets the up-coming hot gas, which transfers its heat to the water—itself becoming cooled during the process. This hot water is, as above described, again used for heating the air-blast; and in this way the gas is cooled and the blast heated by a continuous process of exchange, which, as will be readily observed, is economical to a degree. The mixed steam and air now enter a gas cooler, extracting more heat but without coming into contact with the gas—separate divisions being arranged for its travel. Having passed through an air-jacket on the side of the producer, the air-blast enters the bottom of the producer at a temperature of (say) 250° C., carrying with it a large quantity of steam. The remainder of the steam required is generally furnished from either the exhaust steam from the steam-engines, or is produced by utilizing the hot exhaust gases of gas-engines.

The hot and dirty gases leaving the cooler, where the air-blast is finally heated, enter a mechanical washer, consisting of a long iron box containing a quantity of water, which is agitated by revolving dashers, filling the box with a finely-divided spray. By this means the gas is cooled from 300° to about 85° C. The steam which is generated passes forward with the gas into the ammonia recovery tower, where the gas ascending is freed from ammonia by the action of sulphuric acid, which is caused to flow down the tower in the reverse direction to the flow of gas. The ammonia is neutralized, and the liquor containing the sulphate of ammonia is constantly drawn off to be treated later in the sulphate plant. The composition of Mond gas is approximately as follows: Carbonic oxide, 11-12 per cent.; carbonic oxide, 15-16 per cent.; hydrogen, 27-29 per cent.; nitrogen, 42 per cent.; light carburetted hydrogen, 2-3 per cent. The heating value is about 150 B.Th.U.; and the production of gas ranges from 125,000 to 150,000 feet per ton of coal.

The present general system of carbonization in horizontal retorts is, of course, badly adapted for a high production of ammonia; but the vertical system is similar in some respects to the Mond producer, and, as is well known, produces a much larger quantity of ammonia than the horizontal system. Should a vertical setting ever be required for the production of "coalite" or "carbo," it would doubtless be accompanied by a large yield of ammonia—perhaps 50 or 60 lbs. per ton, if a liberal quantity of steam were used. A high yield of sulphate of ammonia would make such a large difference to the balance-sheets of gas companies that time employed in research work of this kind would be well spent. The Power Gas Corporation, incorporated in 1901 (the owners of the Mond patents), are in very low water, for the £1 fully-paid shares are nominally quoted at $\frac{1}{8}$ to $\frac{3}{8}$, and no dividend has been paid since $3\frac{1}{2}$ per cent. was declared in 1904. It is a matter for surprise that the owners of such an economically arranged plant should yet do so poorly.

Mr. Godfrey M. S. Tait, in an article on "Producer Gas Composition and its Influence on the Performance of Suction Producer Plants," describes an arrangement by which the steam supply is dispensed with, so as to eliminate the hydrogen constituent in the gas. Producer gas, as usually manufactured, contains about 20 per cent. of carbonic oxide, 15 per cent. of hydrogen, and 1·3 per cent. of light carburetted hydrogen (the remainder being inert gases) having a heating value of about 136 B.Th.U. With this type of gas, the author developed 106 H.P. with a modern gas-engine. The apparatus for feeding steam beneath the bed of the producer was then removed. The gas under this condition showed 24·3 per cent. of carbonic oxide and 1·3 per cent. of light carburetted hydrogen, and had a calorific value of 91 B.Th.U. With this gas and the same engine, 114 H.P. was developed. Going a step further, the compression of the engine was increased to 200 lbs. (previous pressure not mentioned), and the exhaust from the engine was admitted under the fuel bed in the producer, for the purpose of diluting the incoming air and reducing the temperature of the fuel bed. These changes having been made, the engine developed 126 H.P. These tests are certainly significant, and suggest that with a gas consisting almost entirely, as far as combustible gases go, of two such different gases as hydrogen and carbon monoxide, some difficulty might be experienced in the pre-ignition or late ignition of the charge, causing in either case loss of power. The object of the article is to suggest that with low-grade gases one constituent is preferable to two.

A very complete article on the "Suction Gas Producer," by Mr. F. J. Rowan, describes every well-known plant of this kind; giving particulars as to the consumption of fuel, the water consumption, formation of clinker, &c., without, however, giving any comparison of costs with other systems. The cost of labour in the working of suction producers is not discussed, nor is the item of wear and tear, except in the mention of an estimate by one maker. The author states that the fuel costs enable suction plants to compare favourably with gas-engines using illuminating gas from town-gas mains, and also that for the larger amounts of power—say, from 150 H.P. and upwards—the cost of town gas becomes prohibitive for economical working. It would have been interesting if Mr. Rowan could have given actual working details of suction plants rather than the exceptional results always to be obtained at exhibition trials under ideal conditions. One thing is quite certain—that, under ordinary working conditions, the gas-engine using town gas will more nearly approximate exhibition results than will the gas-engine using suction gas; for, in the case of the latter, so many more factors in the form of working parts and details—the human machine included—are present to deteriorate from its maximum possibilities.

The technical details of the large gas-engine are discussed in two articles; but it would seem that England is hardly to the fore in the development of these mammoth engines. Perhaps this is not a matter for regret; for we have it, on no less an authority than Mr. Dugald Clerk, that the problems of the large gas-engine are by no means solved as yet. The enormous explosive power on the pistons of these huge engines undoubtedly carries with it the risk of fracture unless the parts are made exceptionally strong; and where this rule is followed, Mr. Clerk points out that the expense incurred is out of proportion to the increased power obtained. The articles in question are profusely illustrated with the most important installations of large gas-engines in the world, many of which were ordered for the purpose of utilizing blast-furnace gas for the production of power.

In an article on "Gas Power on Shipboard," in which the prospects of gas power being used for this purpose are discussed in a favourable manner, mention is made of the utility of "coalite" as a fuel for use in marine suction-gas plants: "There can be no doubt," says the author, "that when (?) its price is sufficiently reduced below that of anthracite, it will be in great demand for this purpose—being a non-caking smokeless fuel and containing no tar. For canal, river, and coasting vessels, whether for business or pleasure, coalite may become the *beau idéal* fuel for gas propulsion." Gas power is undoubtedly becoming an increasingly important subject, and one which will attain even greater prominence in the future than it has in the past.

In this special number of Cassier's, little or no attention has been paid to the increasing popularity of the smaller gas-engine and the successful way in which it has been fostered by the almost general cheapening of gas, and the inducements held out to all power users in the form of large discounts in the price of gas employed for this purpose. One or two articles devoted to this subject would not have been out of place, considering the enormous number of engines using coal gas with most economical and satisfactory results. In scores of places in this country gas of more than four times the calorific value of producer or suction gas is being supplied at prices varying from 1s. 6d. to 2s. per 1000 cubic feet for power purposes. The advantages attending the use of these plants must indeed be great to warrant the expenditure of installing them in preference to using coal gas at this favourable price. The only reference to the gas which is most familiar to readers of the "JOURNAL" is the realistic representation of the interior of an old-fashioned retort-house on the cover of the magazine.

LOCAL ADMINISTRATION AND TAXATION.

THE Thirty-Sixth Annual Report of the Local Government Board, containing particulars of the work of the Department for the year 1906-7, has lately been issued; and, as on previous occasions, we reproduce from it some of the statistics relating to local administration and taxation. The book is, as usual, a very bulky one, though it is not so large as its immediate predecessor. The report itself (which is signed by Mr. John Burns, the President of the Board) occupies 172 pages, and the appendices 496 pages more, compared with 207 and 679 pages respectively before—making with the contents and index a total of 722 pages, against 1000 pages in the report for 1905-6. Yet, as we have pointed out in notices of previous reports, the mass of matter which they contain does not record the whole of the Board's work; as a separate, and almost equally large, volume is devoted to the proceedings of the Medical Department. In the Blue-book under notice, the various subjects are arranged in four groups: (1) The work of county councils under the Local Government Act, 1888; (2) public health and local administration; (3) poor-law administration (including unemployed workmen); (4) local taxation and valuation. It is with statistics contained in the second and fourth groups that our readers are specially concerned.

In the course of the year reported upon, the Board issued 40 Provisional Orders under the Public Health Act, 1875, and three under the Gas and Water Works Facilities Acts, 1870 and 1873. The first-named number included 22 for the repeal, alteration, and amendment of Local Acts and Provisional Order Confirmation Bills. Some of these Orders conferred further powers on local authorities in regard to their gas and water undertakings, including the acquisition of additional lands and their use for the manufacture and storage of gas and residual products; the supply of gas, and of apparatus, &c., used in its consumption for lighting, heating, or other purposes; the application to the purposes of the Orders of existing borrowing powers; the employment of gas revenues; and the extension of the limits for the supply of gas and water. Three of the Orders conferred additional borrowing

powers. For their water undertakings, the Lincoln Corporation were authorized to raise £200,000, and the Uttoxeter Urban District Council such sums as were necessary; and for their gas undertaking, £20,000 was granted to the Tyldesley-cum-Shakerley Urban District Council.

Among the financial, statistical, and other statements in the report is a table showing the loans sanctioned to county borough, town, and urban district councils in respect of their gas and water undertakings in the twelve months ending Dec. 31, 1906. For the first-named purpose, the following were among the loans sanctioned: Abergavenny, £4218; Burnley, £31,495; Carlisle, £10,104; Colwyn Bay and Colwyn, £17,000; Congleton, £8561; Darlington, £48,900; Leek, £9162; Liverpool (Fazakerley Gas Order), £1990; Milton-next-Sittingbourne, £3500; Padiham, £3500; Shipley, £10,800; Stockport, £21,828; Tiverton, £2240; Torquay, £2200; and Widnes, £11,000. Among the larger loans authorized in connection with water supply were: Ampthill, £11,250; Bolton, £4585; Chatteris, £6250; Epsom, £5600; Exeter, £4652; Fairfield, £8000; Gloucester, £4337; Halifax, £31,085; Hastings, £11,405; Horsforth, £4646; Kempston, £10,800; King's Lynn, £5000; Middlewich, £12,972; New Sarum, £5972; Northampton, £6500; Paignton, £3582; Penzance, £4500; Porthcawl, £8550; Runcorn, £6147; Swansea, £14,627; Swindon, £10,872; Teignmouth, £21,830; Torquay, £14,275; Uxbridge, £6000; Warwick, £6841. A number of loans, most of them small, were granted to urban and rural district councils in respect of water supply and the disposal of sewage. The loans to urban authorities for these purposes amounted to £296,114 and £1,392,382 respectively, compared with £406,935 and £1,320,901 before; those to rural authorities, to £135,484 and £306,238, against £113,901 and £313,723. Joint Boards needed £264,193 (inclusive of borrowings by the Metropolitan Water Board) for water supply and £137,449 for sewerage and sewage disposal. Detailed information with respect to all the loans authorized by the Board during the past year—their purpose, the authorities by whom they were raised, and the number of years allowed for their repayment—is, as usual, furnished in tabular form in one of the appendices.

Those of our readers who are in charge of water-works are aware that under section 62 of the Public Health Act, 1875, a district council may apply to the Board to determine the reasonable cost at which water may be required to be furnished to houses without a proper supply; the Board being empowered, by section 8 of the Public Health (Water) Act, 1878, to fix a general scale of charges for the whole or any part of a council's district. Two of these scales were fixed last year for the Urban District Council of Glemsford, and for the Rural District Council of Preston in respect of the contributory place of Farington.

An important branch of the Board's work is that conducted by the Engineering Inspectors, most of it being in connection with applications (principally for sanction to borrow money) under the Public Health Act, 1875, the Local Government Act, 1894, the Electric Lighting Acts, the Public Health (London) Act, 1891, and others. For the investigation of the proposals submitted, 1066 local inquiries were held during the year. Under the first-named Act, the Board recommended the Public Works Loan Commissioners to make advances amounting to £46,386 to local authorities. Of the sums thus recommended to be advanced, £2500 was applied for by an urban district council, and £43,886 by rural district councils. These figures are considerably higher than those for the preceding year, when the total was £23,668, divided into two sums of £13,398 and £10,270 respectively. The Board are required, under the provisions of the Public Works Loans Acts, to satisfy themselves that all loans granted by the Commissioners on the security of the rates have been applied to the objects for which they were needed. Accounts containing detailed information relating to the several payments made out of the 1373 advances, amounting in the aggregate to £3,951,843, were investigated during the year, and portions of the loans remitted to the Commissioners, in pursuance of section 4 of the Public Works Loans Act, 1878. The total of the amounts so remitted was £40,518, compared with £40,256 in the preceding year. In 1906, Parliament conferred borrowing powers, exercisable without the Board's sanction, to the extent of £1,279,220; bringing up to £146,261,311 the total amount authorized during the past 35 years. The table containing these figures is a very interesting one. It shows that in the period named the amount sanctioned never exceeded £8,000,000 till 1899, when it rose to £14,260,981 from £4,822,654 the preceding year. In 1901, it was even higher—viz., £15,643,665. But it then dropped to £7,291,541, £4,934,644, £4,552,201, and £4,475,959 in the four succeeding years. The figures for 1906 show a further falling off to the extent of £3,196,739.

The audits of the accounts of the Councils of the Metropolitan Boroughs and their officers were completed for the year to March 31, 1906, as well as the audit of those of the Metropolitan Water Board and their officers, under the Metropolis Water Act, 1902. The accounts of 810 urban district councils were examined by the district auditors, so were also those of 667 rural district councils, 120 joint boards for sanitary purposes, and 225 joint committees appointed wholly or in part by district councils. In the year ending Dec. 31, 1906, the auditors reported 29 disallowances and surcharges in the accounts of the Metropolitan Borough Councils, 103 in those of town councils, 361 and 259 in those of urban and rural district councils, 26 in those of joint authorities for sanitary purposes, and 3 in those of special gas and water authorities. Many of these, as well as certain decisions, were appealed against; and the Board decided 19 in the first group, 54 in the second, 241 and 52 in the third and fourth, 6 in the fifth, and a like number in the sixth. The accounts of 6467 parish councils, 385 meetings for parishes not having councils, and 107 joint committees of these authorities, were also investigated by the district auditors; the audit in each case including the accounts of the officers of the local authority. No less than 778 parish council and 5339 parish meetings had no accounts during the year ending March 31, 1906. The Board received altogether reports of 126 disallowances and surcharges in connection with parish councils' accounts; and they decided appeals in respect of 37 of them. During the year covered by the report, the complete accounts of the Plymouth Corporation and those of the Merthyr Tydfil Town Council from the date of incorporation were investigated for the first time by district auditors, under the provisions of Special Acts.

Turning to the section of the report which deals with local taxation and valuation, we find that the Board prepared and presented to Parliament returns showing, for the financial year 1904-5, particulars of the receipts, expenditure, and outstanding loans of the various local authorities in England and Wales. These returns relate to the accounts of about 25,900 local authorities. An epitome of the statistics given in one of the appendices shows that the aggregate receipts, inclusive of £33,408,316 received from loans, amounted to £143,594,317; and the aggregate expenditure, with £31,387,006 defrayed out of loans, came to £139,118,631. The receipts included £7,092,515 from gas undertakings, £4,509,858 from water-works, and £2,566,987 from the supply of electricity. On these undertakings there was laid out £5,157,554, £1,702,141, and £993,797. The amounts expended out of loans were: On gas-works, £758,604; on water-works, £37,559,421; and on electric lighting, £4,242,004. The outstanding loans at the close of the year under notice amounted to £466,459,269, of which £23,831,488 had been obtained for gas, £25,638,762 for electric lighting, and £114,698,642 for water supply, including £45,943,557 in respect of loans taken over or raised by the Metropolitan Water Board. Excluding those accounted for by the Board, the amount of loans outstanding against local authorities was greater by 6·8 per cent. at the end of 1904-5 than at the close of the preceding financial year. Including the Board's loans, the increase was 18·4 per cent. Fuller particulars from these returns were given in the articles on "Municipal Income and Expenditure" which recently appeared in the "JOURNAL" (see Vol. XCIX., pp. 752, 819); but reference may be made here to a table in the report under notice showing the extent to which the local debt of England and Wales has grown during a period of twenty-five years. In 1879-80, the total of the outstanding loans of local authorities was £136,934,070; whereas in 1904-5 it was £466,459,269—an increase of £329,525,199. Compared with the National Debt, the figures of which for the years named were £770,604,774 and £796,736,491 respectively, or an increase of £26,131,717, the proportion of local to national indebtedness in 1879-80 was 17·77 per cent., whereas in 1904-5 it was 58·55 per cent.—an increase of 40·78 per cent.

COAL PRODUCTION OF THE WORLD.

THE production and consumption of coal, and the number of persons employed in coal production, in the principal countries of the world, form the subject of an annual statement, prepared by the Board of Trade, which is known as the "Coal Tables;" and the issue for the year 1906—the thirteenth of the series—was published last week. In all there are some twenty-four tables relating to coal—apart from four which deal with lignite and petroleum—and the figures contained therein, besides stating the consumption and production, furnish information with regard to imports and exports, prices, and other matters. As has already been pointed out in the "JOURNAL" (*ante*, p. 241), the figures relating to the output in the United Kingdom during last year constituted a record; and the present report, which appears over the signature of Mr. A. Wilson Fox, enables some interesting comparisons to be made with the corresponding statistics in connection with the other principal countries—though it must be pointed out that these are to a very large extent provisional, the actual figures being given in almost every case up to the end of 1905. The 1906 figures, however, may doubtless be taken as sufficiently accurate for practical purposes; and, therefore, attention will be confined to them. In one respect, at any rate, the present return enjoys an advantage over its predecessors, in that the quantities are throughout expressed in tons of 2240 lbs.; the particulars of the output, &c., of such foreign countries and British Colonies as use the metric ton of 2204 lbs. or the short ton of 2000 lbs. having been converted for the purpose.

The total known coal production of the world in 1906 (exclusive of brown coal or lignite) was about 905,000,000 tons, rather less than one-third of which was attributable to the United Kingdom. This is a big increase on the previous year, when the figure was given as 840,000,000 tons. The five principal coal-producing countries are the United States, the United Kingdom, Germany, France, and Belgium. The production of the United Kingdom, Germany, and the United States last year in each case consti-

tuted a record, the figures being: United Kingdom, 251,068,000 tons, or an increase over 1905 of 15,000,000 tons; Germany, 134,914,000 tons, or 15,500,000 tons more; and the United States, 369,672,000 tons, or an increase of nearly 19,000,000 tons. Labour disputes in the Northern coalfields put back the production of France last year nearly 1,000,000 tons (from 34,652,000 tons to 33,762,000 tons); but, on the other hand, the output of Belgium (23,232,000 tons) was greater than in any year since 1903. It will be noticed how far France and Belgium are behind the enormous quantities of coal raised in the United Kingdom, Germany, and the United States; and of the remaining countries mentioned in the tables, there is only one—Russia—in which the production exceeds 20,000,000 tons. It will be seen that, while the production of the United States is very nearly 50 per cent. above that of the United Kingdom, that of Germany is only about half, and that of France and Belgium combined rather more than one-quarter, of the production of this country. When, however, the production is considered in relation to the population, the United Kingdom is still ahead; the figure being 5¾ tons per head, against 4½ tons in the United States, 3¼ tons in Belgium, 2½ tons in Germany, and only 0·86 ton per head in France. The numbers of persons employed can only be given for 1905, when they were as follows: United Kingdom, 837,100; United States, 626,300; Germany, 493,300; France, 171,500; and Belgium, 134,700. In the matter of output per person, the United States is first with 560 tons, then the United Kingdom with 282 tons, Germany with 242 tons, France with 202 tons, and Belgium with 159 tons.

So far as figures are available for the year 1906, they go to show that the largely increased output was accompanied by a rise in the average value per ton of the coal at the collieries amounting to 4d. per ton in the United Kingdom, 3½d. in Germany, and 1¼d. in the United States. The values for the five leading countries over the past three years are given as follows: United Kingdom—1904, 7s. 2½d. per ton; 1905, 6s. 11½d.; and 1906, 7s. 3½d. Germany—1904, 8s. 6½d. per ton.; 1905, 8s. 7¾d.; and 1906, 8s. 11¼d. United States—1904, 5s. 10¾d. per ton; 1905, 5s. 8d.; and 1906. 5s. 9¼d. France—1904, 10s. 10½d.; 1905, 10s. 6¾d.; and 1906 (not available). Belgium—1904, 10s. 8d.; 1905, 10s. 2¾d.; 1906 (not available). In continuation of these figures, it may be pointed out that in 1905 the average value of coal per ton in this country was less than in any year since 1898. The value for the United States in 1905, was about the same as in 1902; and though it was less than in 1903 and 1904, it was higher than in any previous year since 1888. These figures, of course, represent the value of all classes of coal in the aggregate at the colliery; and in any comparison made between them, it is necessary to remember that the figures are influenced by many circumstances besides quality. The prices of coal in the various markets are, of course, very different from the figures just quoted. For instance, at Cardiff the price during the first week of October of "large, very best" coal is given as 12s. 9d. per ton in 1905, 15s. to 15s. 3d. in 1906, and 19s. 6d. to 20s. in 1907. The retail prices quoted by a large London firm for the last week in October for "best Wallsend" are 24s. 6d. per ton including delivery in 1905, 25s. 6d. in 1906, and 27s. 6d. in 1907.

The outputs in the British Colonies and Possessions are not in any case on a very large scale—in no instance as much as 10,000,000 tons; but with one very trifling exception the figures for 1906 exhibit a satisfactory increase. The production in British India was 9,783,000 tons in 1906 and 8,418,000 tons in 1905; in the Australian Commonwealth, 8,596,000 tons in 1906 and 7,494,000 tons in 1905; in New Zealand, 1,730,000 tons in 1906 and 1,586,000 tons in 1905; in Canada, 8.717,000 tons in 1906 and 7,739,000 tons in 1905; in the Transvaal, 2,583,000 tons in 1906 and 2,327,000 tons in 1905; in Natal, 1,239,000 tons in 1906 and 1,129,000 tons in 1905; and in the Cape of Good Hope (the solitary instance of a falling off), 128,000 tons in 1906 and 147,000 tons in 1905. During 1906, the output per head of the population in Australia was just over 2 tons; some of the other proportions being: New Zealand and the Transvaal, rather less than 2 tons; Canada, nearly 1½ tons; and Natal, about 1 ton. The average value at the pit's mouth of coal produced in the different Colonies and Possessions varies enormously comparing one place with another. The following figures will show this, as well as the rises or falls that have taken place during the past three years: British India—1904, 3s. 5d.; 1905, 3s. 4d.; and 1906, 3s. 11d. per ton. Australian Commonwealth—1904, 6s. 10d.; 1905, 6s. 2d.; and 1906, 6s. 3d. per ton. New Zealand—1904, 10s. 9d.; 1905, 10s. 7d.; and 1906, 10s. per ton. Canada—1904, 9s. 3d.; 1905, 9s. 4d.; and 1906, 9s. 4d. per ton. Transvaal—1904, 8s. 3d.; 1905, 7s. 3d.; and 1906, 6s. 5d. per ton. Cape of Good Hope—1904, 20s.; 1905, 18s. 8d.; and 1906, 18s. 5d. Natal—1904, 10s. 8d.; 1905, 8s. 3d.; and 1906, 8s. 6d.

The consumption of coal in each country is arrived at by adding the imports to the home production and deducting the exports; and this process reveals some interesting facts. The countries which export coal in excess of the amount they import are the United Kingdom, Germany, the United States, Belgium, and Japan; and, among British Colonies and Possessions, the same remark applies to the Australian Commonwealth, Transvaal, Natal, and British India. The excess of exports over imports during 1906 in these cases was: United Kingdom, 76,739,000 tons; Germany, 15,632,000 tons; the United States, 8,180,000 tons; Japan, 2,380,000 tons; Belgium, 723,000 tons; the Australian Commonwealth, 2,046,000 tons; the Transvaal, 62,000 tons; Natal, 730,000 tons; British India, 678,000 tons. Both the gross and net exports of the United Kingdom, Germany, and the United States were the greatest on record. The report remarks that the wave of industrial prosperity abroad which has been in progress during 1906-7 has led to an increased foreign demand for British coal. The total quantity exported during the first nine months of 1907 was 46,884,000 tons, as compared with 41,230,000 tons and 35,309,000 tons during the corresponding periods of 1906 and 1905. This increase was due chiefly to the larger exports of steam and gas coal, which form the bulk of the exports from this country. The imports of coal into Germany in 1906 (10,175,000 tons), though not quite so large as in 1905, were considerably in excess of those for most recent years—the average for the five years 1900-4 having been only 7,557,000 tons; and a large proportion of this increase was obtained from the United Kingdom, whose exports to Germany during 1906 constituted a record. At the same time, the exports of German coal last year increased by 2,500,000 tons—most of this additional quantity having gone to France. The principal coal-producing countries which in 1906 imported more coal than they exported, with the excess of the imports, were as follows: Russia (4,484,000 tons), Sweden (3,995,000 tons), France (16,536,000 tons), Spain (2,531,000 tons), Italy (7,519,000 tons), Austria-Hungary (6,745,000 tons), Canada (5,021,000 tons), New Zealand (66,000 tons), and Cape of Good Hope (447,000 tons). Mr. Fox is careful to point out that the question of the exports of coal from each country is complicated by the fact that the published returns do not in all cases show the procedure with regard to bunker coal—which is included in some cases, but not in others.

In 1906, the four largest coal consuming countries were: United States, 361,492,000 tons, or 4·3 tons per head of the population; United Kingdom, 174,329,000 tons, or 3·99 tons per head; Germany, 119,282,000 tons, or 1·94 tons per head; and France, 50,298,000 tons, or 1·28 tons per head. Thus the consumption of coal in the United States is now twice as great as that in any other country; while the consumption per head of the population is also greatest there. In considering the figures for France and Germany, it has to be remembered that a large quantity of other fuels is used there—such as turf, wood, lignite, and denatured spirits. The consumption per head in Canada (2·3 tons) is higher than that in any other of the British Colonies. In the United Kingdom in 1906 99·98 per cent. of the coal consumed was of native production, and in the United States 99·52 per cent. In Germany, 91·48 per cent. was native, 6·29 per cent. British, and 2·23 per cent. from other countries. In France, 63·64 per cent. was native, 16·66 per cent. British, and 19·7 per cent. from other countries. In Belgium, 73·43 per cent. was native, 6·79 per cent. British, and 19·78 per cent. from other countries. Last year about 7,500,000 tons of British coal was consumed in Germany, and about 8,333,000 tons in France. Some particulars were given as to the destinations, &c., of our exported coal when noticing in the "JOURNAL" the Home Office report already referred to relating to the coal output of the United Kingdom; and we will only remark here that Germany, France, and Italy are our three best customers in this respect.

In 1905, the production of lignite in Germany was 55,668,000 tons, in Austria 22,327,000 tons, and in Hungary 5,991,000 tons. The quantity of lignite produced in the United States is included in the coal figures already given; but in 1905 it amounted to 6,149,000 tons. In no other country does the quantity produced reach a million tons. The total production of petroleum in the United States in 1906 was 4,587,000,000 gallons, compared with 4,715,000,000 gallons in the previous year. The Baku oil-fields of Russia yielded 1,846,000,000 gallons, as against 1,691,000,000 gallons in 1905; but both these results are considerably below those in most recent years. The combined output in 1905 of Germany, Austria, Roumania, Japan, Canada, British India, and Java and Sumatra was rather more than 750,000,000 gallons.

The London and Southern District Junior Gas Association will meet on Friday evening at the Cripplegate Institute, for the purpose of hearing a paper read by Mr. W. H. Harriss on "Ventilating and Warming."

The Midland Junior Gas Engineering Association will meet next Saturday, at the City of Birmingham Technical School, when papers will be read by Mr. C. H. Edmonds on a "Practical Aspect of Cyanogen Extraction," and by Mr. W. E. Cadwallader on the "Supply of Gas to Private Dwellings."

Phenols in Gas Liquor.—At the meeting of the Manchester Section of the Society of Chemical Industry last Friday, Dr. F. W. Skirrow occupied the attention of the members for more than an hour in giving details of some experiments on the determination of phenols in gas liquors, and of their distribution in liquors obtained in various parts of the purifying plant.

The Chemistry of Gas Manufacture.—Mr. W. J. A. Butterfield writes to thank us for remarking, in the article headed "A Manual for Gas-Works' Chemists" in the last number of the "JOURNAL" (p. 697), that it is a pity the new book therein referred to should have been given the title "The Chemistry of Gas Manufacture," which has been associated with a work by him since 1896. He adds that he has requested the Publishers—Messrs. Charles Griffin and Co., Limited—in whom the copyright of his book is vested, to "take steps to prevent the use of its distinctive title by another author and other publishers."

THE AMERICAN GAS INSTITUTE AND ITS WORK.

[COMMUNICATED.]

IN connection with the recent meeting of the American Gas Institute, your readers may be interested in knowing something of its present organization and future plans. It was formed by the amalgamation of the American Gaslight Association, the Western Gas Association, and the Ohio Gaslight Association. The first two had for years been working side by side as national organizations; but when the Ohio Association began to expand, and to claim recognition as another national body, it was seen that the best interests of the gas profession in the United States demanded one organization only.

The Institute resulted; and it must justify its existence by definite accomplishment. The organization by which it hopes to succeed is such that all its work is in the hands of its sixteen Directors, and also two General Committees—viz., "Public Relations" and "Technical"—each consisting of six members. The Directors will look after the business affairs of the Institute; the Public Relations Committee after all matters directly affecting the relations between the Institute, or its members, and the public, or any governing bodies; while the Technical Committee will have charge of all questions relating to gas engineering or the operating of a gas company. Each Committee may appoint its own Sub-Committees, only one of whose members need be a member of the General Committee.

It is hoped that by thus concentrating the responsibility for work in the hands of comparatively few men, much better results will follow than from the organization obtaining in the old Association—viz., that of many Committees, each appointed by the Association at various times, and often overlapping in sphere of work. The Chairman of the Public Relations Committee is Mr. E. G. Cowdery, the Vice-President of the Chicago Gas Company. The Chairman of the Technical Committee is Mr. W. H. Gartley, the Engineer of Works of the Philadelphia plant of the United Gas Improvement Company. The Technical Committee have already appointed Sub-Committees on "Uniform Accounting," "Unit of Light," "Pipe Standards," and "Electrolysis;" and the prospects are favourable for good work in these and other lines during the coming year.

The question of uniform accounting has become a very important one within the last year. For years there has been a Gas Commission in Massachusetts; and the gas companies in that State have had to report their operations every year according to a prescribed form, which, by the way, has not met the approval of the gas industry as a whole. As long as there seemed no disposition on the part of other States to appoint Gas Commissions, or to require the publication of accounts, the advantages to be gained by the adoption of the same system of accounts by all gas companies in the country did not seem of sufficient importance to secure adherence to any one system, even though an admirable one was adopted by the American Gaslight Association in 1902. Now, however, that both in New York and Wisconsin Commissions have been given charge of gas companies, and will prescribe the form of accounts to be kept, it has become of the greatest importance to the gas industry that all companies unite on one system and procure its adoption by all Commissions, now or to be established. If this end is reached, then in that not far-distant day when all gas accounts will be published, the gas profession will be able to compare results, and the able managers will be known to all. If each State should have its own form of accounts, comparisons will be difficult, and syndicates, owning companies in various States, will be forced to keep one set of accounts for each State.

The result of commission control on the public utility companies will be watched with intense interest. In Wisconsin, a valuation will be made of all plant values; then a proper rate of return determined for the value represented by each company; and on this rate will depend the price to be charged. It is evident that if the mistake is made of fixing a rate too low to attract capital, every citizen will soon suffer from a deterioration in the service furnished by the companies; and the suburbs of all cities will not be able to secure lighting, telephonic, and street-railway facilities as promptly as in the past. This country—in which nine out of every ten city houses are provided with gas or electricity, and one out of every four with telephones—has so far been a striking illustration of the truth that greater benefit results to the people as a whole from a system permitting undue rewards to capital, than would obtain under governmental control, accompanied by the fixing of prices too low to attract capital to public utility companies.

To return again to the Gas Institute. Its organizers recognized that the increasing interference of City and State governments in the management of gas companies would soon force these companies to form State Associations, the primary purpose of which would be to enable these companies to act as a unit in regard to any proposed action, either by legislation or by commissions. Already the value of the New York State Association to the companies has been proved by the dealings it has had with the New York Public Utilities Commissions. At its annual meeting a State Association would, of course, desire to discuss technical and business matters, as well as relations with the State and municipalities. It was deemed highly important that the Institute should be in a position to guide the action of the State Associations in every point where such action would affect the interests of the gas industry as a whole. Therefore, the "Constitution" of the Institute provides that any State Association applying for affiliation shall be allowed to name a representative on the Board of Directors of the Institute, and must obligate itself to do some technical work each year under the direction of the Institute.

Several State Associations have applied for affiliation; and the Institute is alone to blame that the agreements are yet to be ratified. It is believed, however, that before the next Directors' meeting occurs, the representatives from the Affiliated Associations will have their credentials. The Technical Committee will enter into correspondence with each Affiliated Association in regard to the work to be assigned to it for the coming year. It would seem probable that the Michigan Association would be asked to continue its naphthalene investigations; while the Wisconsin Association, having called attention to the advisability of a study of the various gas coals in the country, may be assigned this subject.

Your readers will perceive from what has been written, that the gas profession in this country is in a splendid position to work unitedly for the advancement of the industry, and that any failure to obtain results may be justly attributed to the Institute and its officials. Failure, however, is not expected from the men who are charged with this heavy responsibility.

All publications of any length, relating to the gas business, have for years been written by British authors for British engineers; and though the theory may be the same on both sides of the water, practice and apparatus differ sufficiently to make the American engineer often wish some of his colleagues would take the time to write an American book on the manufacture and distribution of gas. Such a work would be of great assistance to the young men who every year enter the gas business—graduates though most of them are of technical schools. It was hoped that the "Handbook of American Gas Engineering Practice," just published, would fill the want;* but unfortunately the author has proved so ignorant of the fundamental details of the profession that his book is misleading to students, and its copious extracts from various sources are not extensive enough, nor well enough arranged, to justify regarding the work as an aid to the gas engineer. It is only charitable to suppose that the rather flattering brief mentions of the work that have appeared in our American gas periodicals were written by those who had not carefully studied the book.

ESTIMATION OF NAPHTHALENE IN COAL GAS AND SPENT OXIDE.

AT a Meeting of the London Section of the Society of Chemical Industry, at Burlington House yesterday week—the CHAIRMAN (Mr. R. J. Friswell) presiding—Mr. C. J. DICKENSON GAIR, of the Vauxhall works of the South Metropolitan Gas Company, read a paper on the above subject.

The author prefaced the paper by reminding those present of one he had previously read on the subject.† In the course of the discussion on that occasion, it was suggested that it was a slight disadvantage that the method of estimation he proposed should be solely a gravimetric one. Further consideration convinced Mr. Gair that this was so. To remedy the defect, certain experiments were instituted, resulting in the acetic acid method being so modified that it could be applied either gravimetrically or volumetrically. The quantity of acetic acid, of a specific gravity not higher than 1·044, used in the test, he advised should not be too great, but should be varied in quantity according to the quality of the gas as regards naphthalene content. He quoted the following figures as being useful:—

Approximate Naphthalene in grains per 100 c. f. of Gas.	Cub. Cent. of Acetic Acid or Picric Acid in Reprecipitation Test.
5–15	200
15–60	400
60–80	450
80 and above	500 and above

Having determined the cubic centimetres of acetic acid to be used in the test, the quantity is put in two Dreschel bottles, closely connected, with short lengths of indiarubber tubing, to another Dreschel bottle containing 150 c.c. of strong picric acid to act as a catch. A measured quantity of gas (not more than 10 cubic feet usually) is passed through at the rate of about 0·75 cubic foot per hour. Should the gas be impure as regards ammonia, concentrated oxalic acid solution is used in a Woulff's bottle placed before the acetic acid bottles. The requisite volume of gas having been passed, the three bottles are disconnected, and their contents mixed in a flask with about 500 c.c. of concentrated picric acid. The flask is well agitated, and allowed to stand; and the pure naphthalene picrate, which separates out in large flocculent masses, is filtered.

The gravimetric method was described, in some detail, in the previous paper; and the volumetric method as now explained by

* This is the work reviewed in the "JOURNAL" last month, p. 479.
† See "JOURNAL," Dec. 12, 1905, p. 749.

Mr. Gair is on these lines: The precipitate is washed with from 300 to 500 c.c. of dilute picric acid solution of not less than $\frac{N}{40}$ strength, which entirely removes the acetic acid remaining in the precipitant. Without this removal, the accuracy of the test would be destroyed. In the experiments, it was found that dilute picric acid solution was the only thing that would remove the acetic acid without decomposing or dissolving the naphthalene picrate. The bulkiest precipitant only requires a slight washing. Succeeding the washing, the precipitant is transferred to a beaker by means of a small quantity of distilled water. The water is made up to 180 c.c., and $\frac{N}{10}$ Na O H is added—10 to 25 c.c., it was understood, being usually sufficient. The liquid is boiled for ten minutes, with occasional stirring. The effect of boiling naphthalene picrate with sodium hydrate is to decompose it according to the equation—

$$C_{10}H_8C_6H_2(NO_2)_3OH + NaOH = C_{10}H_8 + C_6H_2(NO_2)_3ONa + H_2O.$$

Any excess of sodium hydrate is left behind. A few drops of lacmoid indicator added to the boiling liquid will by the green colour denote an excess. In the event of there being no excess, more $\frac{N}{10}$ Na OH is added; and the liquid is again boiled. Finally, the hot liquid is transferred to a porcelain basin, and $\frac{N}{20}$ picric acid solution is added in excess, titrating again with $\frac{N}{10}$ Na OH until the olive green tint again becomes permanent. The total cubic centimetres of $\frac{N}{10}$ Na OH used are noted; and the $\frac{N}{10}$ Na OH equivalent in cubic centimetres; of the $\frac{N}{20}$ picric acid used is found and deducted from it. The difference is the number of cubic centimetres of $\frac{N}{10}$ Na OH actually used up in the experiment. Seeing that each cubic centimetre of $\frac{N}{10}$ Na OH corresponds to 0·0128 gramme or 0·197 grain, the result is readily arrived at. The method is rapid and accurate. Consecutive experiments gave the following results:—

Naphthalene passed into Apparatus. Grains.	Naphthalene found by Experiment. Grains.
0·500	0·492
0·750	0·748
0·250	0·252

Test accuracy equals 98·5 per cent.

It was interesting to hear that comparative experiments against Messrs. Colman and Smith's method corresponded closely.

Another method—called the reprecipitation method—was devised by Mr. Gair during the above experiments. It commences in a similar way to Colman and Smith's test—*i.e.*, only picric acid in sufficient quantity is used; but after taking the test off, the precipitate is filtered and transferred to a flask with a small quantity of concentrated picric acid solution. Absolute alcohol is added in quantity sufficient—ordinarily 50 to 100 c.c.—to completely dissolve the precipitate; a yellow liquid, remaining. On adding 300 c.c. of strong picric acid, and well agitating the liquid, pure naphthalene picrate at once separates out, and is filtered off. The procedure follows that of the acetic acid method; only it is unnecessary to wash the precipitate with picric acid solution before being decomposed. Three-quarters of an hour suffices for carrying through the method, which the following results show to be very reliable:—

Naphthalene Passed into the Apparatus. Grains.	Naphthalene Found by Experiment. Grains.
0·250	0·252
0·400	0·394
0·750	0·748
0·570	0·571

Test accuracy 98·5 per cent.

In what was practically the second part of the paper, Mr. Gair showed how the reprecipitation method can be modified to estimate naphthalene in spent oxide of iron. In a small flask, 10 grammes of undried oxide are placed with 100 c.c. of 80 per cent. alcohol. The flask is corked, agitated, and permitted to stand three or more hours, after which the naphthalene will be dissolved out of the oxide. The liquid is filtered into a flask of large dimensions; and the filter paper is washed once or twice with diluted alcohol. After adding 300 c.c. concentrated picric acid solution, the flask is agitated, and allowed to stand. All that has to be done now is to treat the naphthalene picrate in the same manner as in the reprecipitation test. In concluding his description of this method, Mr. Gair stated that it was accurate to *plus* or *minus* 1 per cent.

Discussion.

Dr. Harold G. Colman said there was nothing much that he could add to what Mr. Gair had given in his paper in regard to his methods for estimating naphthalene. He (Dr. Colman) believed that he stated on the occasion of Mr. Gair's previous paper that personally he had preference for the volumetric method for works' analysis of this kind; and he was glad Mr. Gair had been able to modify his method so that it was volumetric instead of gravimetric. He had himself found that pure naphthalene picrate could be determined quite correctly in the way Mr. Gair described; and he saw no reason why the modifications now described should not give equally correct results with the other methods to which Mr. Gair referred.

Dr. Samuel Rideal said it was somewhat interesting to note that a substance like naphthalene, which had always been a great trouble in gas-works' practice, was being studied by the experts of gas manufacturers themselves, and that it had been left to them to evolve methods of analysis with a view to the prevention of the trouble arising from naphthalene rather than to tests being imposed upon the companies by legislation. Chemists, as a rule, were severely criticized in many industries, especially in those under parliamentary statutes, and had been in the past responsible for having onerous tests put on them. In the case of gas companies, they had themselves been successful in evolving new tests which were useful for the public. This naphthalene test was not the only test that had been brought out by the experts of the South Metropolitan Gas Company. Take, for example, the new test-burner now universally used in London and many provincial districts for determining illuminating power. It was Mr. Carpenter, of the South Metropolitan Company, who invented this burner. Now they had here another test for determining the quantity of an impurity in the gas which had caused no end of trouble and nuisance to the consumers; and with a satisfactory test for determining the amount of naphthalene in the gas, the experts of the companies would be in a better position to advise as to its diminution or prevention.

Mr. Gair, in reply, said he stood in the happy position of being without critics—at any rate, he thought he could say so in regard to this meeting. He heartily thanked Dr. Colman for his remarks. He was glad that Dr. Colman had been able to corroborate his views. Had he not done so, he confessed that he should have been somewhat diffident as to their correctness. Respecting the tests themselves, there were one or two remarks he should like to make which he did not bring out in his paper, but which he might introduce here. In all naphthalene tests (and Dr. Colman would bear him out in this statement) some little difficulty was experienced owing to the fact that the naphthalene in coal gas if brought into a cooler atmosphere was extremely ready to condense; and they always found it more or less in the leading tube of the apparatus. This naphthalene could not be discarded because it was part of the naphthalene actually in the gas which had to be estimated. If they discarded it, they were actually making the naphthalene found in the gas lower than it should be. The best way to deal with the difficulty was to wash the tubes out with a few cubic centimetres of alcohol, and add this to the acetic acid or picric acid of the test as the case might be. As to the filter papers used in these tests, he did not care to put any particular firm's papers forward as being better than those of any other firm. But he was bound to say that for these tests he had found Messrs. Schleicher and Schull's 15 cubic centimetres No. 575 filter papers were practically without equal. If these could not be procured, however, their No. 597 were excellent substitutes. He had been trying some experiments with various indicators in these naphthalene tests. They pinned their faith a great deal to Lacmoid indicator. It was an excellent indicator to use; and they did not find they could better it very much. He tried methyl orange, and found it was usable; but it gave a rather indistinct end reaction. Phenolphthalein, on the other hand, gave a very good end reaction; and the results were practically identical with results found with Lacmoid. Care should, however, be taken that solutions had previously been boiled to expel carbon dioxide. Finally, he should like to say that it was advisable to make up the liquid to be titrated to a known volume, and to separately titrate the two halves of it. In this way, they got results which he had satisfied himself were accurate to 98·5 per cent.

The Mystery of the Divining Rod.—Readers will doubtless remember that about three years ago the subject of the use of the divining rod for finding water was much discussed in the columns of "The Times," and that some articles thereon appeared in the "Journal." The matter had been inquired into by Professor Barrett, of the Royal College of Science for Ireland, on behalf of the Society for Psychical Research; and it was investigated, as the outcome of the writing referred to, by Professor Wertheimer, Principal of the Merchant Venturers' Technical College, Bristol. The conclusion arrived at by the latter, as the result of his experiments, was that the evidence was insufficient to show that the successes of the water-finders are not due to accident. The literature of this subject has just been added to by Mr. Charles E. Jones, Assoc.M.Inst.C.E., who was for some years the Engineer of the Chesterfield Water and Gas Company, in a pamphlet which is being published at the offices of the "Journal," at the price of 1s. Mr. Jones has collected some exceedingly interesting historical particulars in regard to divination; and, after reviewing the various opinions held on water-finding, he gives particulars of a recent successful case near Knutsford, accompanied by a plan of the farm on which it occurred. The author is evidently in the ranks of those who believe that dowsing is something more than mere trickery; and we commend his pamphlet to the notice of water engineers and others who are desirous of learning his views upon the subject.

THE ALLEGED DANGERS OF COAL GAS.

II.

About this time last year, there appeared in the "Journal für Gasbeleuchtung" an article written by Herr Franz Schäter, of Dessau, to which the above title was given; the communication being afterwards fully abstracted in the "Journal" for Dec. 18, 1906. The aim of the article was to collect all possible statistics relating to the consumption of gas and electricity in Germany; to prove from the figures that, in comparison with electricity, gas was used by many more people and in far larger quantity; and so to point out that the dangers introduced into civilized life by the employment of gas were far smaller than those introduced by the adoption of electrical current. So long as the original article was confined to the pages of a technical publication, where "doubtless it served its purpose of putting fresh heart into gas engineers vainly struggling to cope with the inroads of electricity," the matter was not deemed worthy of detailed attention; but when the figures began to be reproduced in the newspaper press of the country, it was felt by the electricians high time to make a counter demonstration for the benefit of the general public. Accordingly, in the columns of the "Elektrotechnische Zeitschrift," Herr Dettmar, of Grunewald, near Berlin, essayed to cast discredit on Herr Schäfer's writing, arguing that his data were incorrect, and the lessons he drew from them of necessity erroneous. Inasmuch as Herr Dettmar's methods of comparison were somewhat peculiar, and his treatment of the statistics which are available was open to objection, Herr Schäfer has recently published a rejoinder in the "Journal für Gasbeleuchtung," in the course of which he examines at full length the criticisms offered by Herr Dettmar, disproves their accuracy, and, employing some of the data supplied by Herr Dettmar himself, demonstrates that his own main argument is, in reality, greatly strengthened thereby.

The Consumption of Gas and Current.

Herr Dettmar rejects the whole of the conclusions based by Herr Schäfer on the figures relating to the amount of energy, and especially the number of meters, supplied by public gas and electricity works, on the ground that the majority of single gas connections are small, whereas those consuming electricity are large. Herr Schäfer replies that, according to the last returns published by the Electrotechnische Zeitschrift, the size of an average electrical installation is 42 standard lamps, whereas that of an average gas installation is 10 standard lights; and since one standard gas-burner is equal as a source of light or energy to at least three, and as a source of heat to eighteen, electric lamps of standard illuminating power, the difference in average size is not great. The figures published as to the capacity of the electricity and gas meters erected during the period of time under review show that gas makers have at least as many large individual customers as are possessed by the electricians. Moreover, as was argued in the first article, the degree of danger to life or property introduced by gas and electricity does not depend so much upon the size of individual installations, as on their number, or, more correctly speaking, upon the comparative number of people who consume the two sources of energy, and the comparative number of premises—factories, dwelling houses, and the like—in which they are utilized. Hence it is quite permissible to base comparisons upon the number of connections belonging to gas-works and electricity supply stations respectively—a method regularly employed by fire insurance officials. But useful conclusions cannot be arrived at from the statistics drawn up by fire insurance companies as to the causes of fires, unless it is approximately known how many of the premises which are insured are actually exposed to the risk of fire or damage from gas and from electricity. Similarly, the returns published by the fire brigade of any large city can only be employed for the same purpose if figures are submitted showing the number of buildings in the town which are supplied with gas and with electricity. As far as Herr Schäfer is aware, absolute figures of this kind have never been issued; so that the investigator can do nothing but base a comparison upon the connections of the various gas-works and electricity generating stations in the districts under consideration.

Herr Dettmar takes exception to all the figures used by Herr Schäfer, which are derived from the returns of the Royal Statistical Office of Prussia. Herr Dettmar states that the figures are incomplete, and that the officials themselves do not know the degree of their incompleteness. Nevertheless, Herr Dettmar proposes to make use of them in the following manner. The figures issued by that office indicate that during the year ending with March, 1906, new steam plant equivalent to 89,500 H.P. was laid down in Prussia, an amount which for the whole of Germany should be equivalent to an increase of 135,000 H.P. After obtaining from makers the number of dynamos delivered in Germany during the year 1906, and correcting the figures to remove certain omissions, Herr Dettmar finds that 8660 dynamos, having a total capacity of about 750,000 H.P., were sold in the period stated, and that, roughly, four-fifths of the current they yielded was generated by means of steam. On this basis, Herr Dettmar makes out that the Prussian Government statistics can cover only (135,000 ÷ 600,000 =) some two-ninths of the total steam-horse-power laid down. He proceeds to assume that every dynamo installed in Germany during the last fifteen years is still in use; that the error in the official Prussian figures has been the same throughout that period; and so he finally arrives at the result that on April 1, 1906, about 6,000,000 H.P. was in use for generating electricity in Germany.

Since the last figures published by the Elektrotechnische Zeitschrift show that approximately 900,000 H.P. are being developed in the public electricity generating stations of Germany, Herr Dettmar concludes that the private electricity plants have approximately six times the total capacity of the public plants; whereas Herr Schäfer estimated them in his first article to be of roughly equal dimensions. To all this Herr Schäfer rejoins that it would be interesting to learn what the officials in the Royal Statistical Office of Prussia would say to Herr Dettmar's treatment of their figures. As already admitted, the figures are undoubtedly imperfect—perhaps more imperfect than Herr Dettmar believes; but their imperfection does not necessarily lie in the direction he indicates, nor is there any proof that the degree of imperfection has remained the same during the last fifteen years. Nevertheless, had Herr Schäfer's calculations been based solely upon the figures published by the Prussian Department in question, they might appear to require considerable modification, were it not for the curious fact that, accepting Herr Dettmar's own data and methods of comparison, results are obtained practically identical with those quoted in the original article. Thus, Herr Dettmar states that the total energy developed in Germany from coal by electricians during the year 1906 was 6,000,000 H.P.; the increase during the year being 750,000 H.P. Since it is not customary for gas engineers to return the capacity of their works in terms of mechanical energy, a similar figure for the gas industry can only be obtained by indirect means.

The number of gas-meters officially stamped in Germany, which (see "Journal" *loc. cit.*) was 333,766 in 1904, rose to 407,586 in 1905, and 425,920 in 1906.* The average size of a gas-meter is known to be a little over ten lights, or, in terms of mechanical energy, a trifle over 2 H.P. Hence the meters freshly brought into action during 1906 represented a nominal increase of over 850,000 H.P.; and since the actual number of lights served by a meter is nearly always 50 per cent. or more above the nominal, these 425,920 new meters represented an actual increase of over 1,275,000 H.P. Thus, on the lines deliberately chosen by Herr Dettmar for comparison, the total increase in capacity of the public gas-works of Germany during 1906 (without taking into consideration any of the private plants) is shown to be greater than the total increase in capacity of both the public and the private electricity generating stations of the Empire. Or, utilizing Herr Dettmar's figure of 6,000,000 H.P. for the total capacity of all the plant laid down in Germany during the past fifteen years for the generation of current from steam, and comparing it with the number of gas-meters sent up for official stamping, it will be found that the total number of such meters was over 3,250,000, and that they had a nominal capacity of over 6½ million, or an actual capacity of approximately 10,000,000 H.P.

Herr Dettmar equally objects to Herr Schäfer's method of converting the current and the coal gas supplied into terms of energy, because Herr Schäfer assumed that the average gas-burner was alight for 500, 600, or more hours per annum; whereas the average electric light was only used for 300 to 400 hours. The latter is the actual figure obtained from statistics published by electricians themselves; and when Herr Dettmar asserts that the average electrical "point" is used for 500 or 600 hours, he includes motors. If gas-engines were included among the gas "points," the mean figure would become much higher, for the average gas-engine runs for more than 1200 hours a year.

In his original article, Herr Schäfer expressed the opinion that the private electricity plants in Germany developed about the same total amount of energy as the public stations, and that the private plants making gas of one kind or other were at least equal in capacity to private electricity plants. But, as a matter of fact, the total capacity of the private gas plants is much greater than that of all the public gas undertakings of the country. It is necessary to include among the figures nominally relating to coal gas all analogous statistics covering the gases employed for domestic or industrial purposes, because fire brigade and fire insurance authorities term all gaseous fuels "gas" without making discrimination as to their nature or origin, and since they all present fire risks however utilized, without stopping to consider whether each product is used by the manufacturer, by his immediate neighbour, or by a consumer at some distance from the place of generation. The electrical industry is in no way treated unfairly by the inclusion of figures respecting gases other than coal gas, for the phenomena of their production and use are strictly parallel to those which accompany the generation and employment of current on electro-chemical and electric-smelting works, whose output has been added by Herr Dettmar to the rest of his electrical data.

The quantities of gas produced by the metallurgical coke-ovens of Germany during 1906 were rather more than the total consumption of all the town lighting plants in the country. Even the private plants making ordinary coal gas are not to be ignored.

* The number of meters officially stamped during 1906 would have been considerably higher than this had it not been for the introduction of uniform gas prices in Cassel, Hamburg, and other towns during that year. The altered method of charging caused a reduction of 20,000 in the number of meters required within the city of Hamburg alone.

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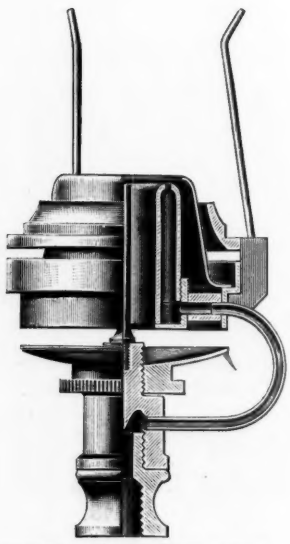

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For example, the gas-works at the Krupp Steel Factory produced nearly 700 million cubic feet—a quantity exceeding that which was made by the Municipal works at Munich; while the Krupp dynamos only generated a little over 13 million k.w.-hours, or less than a ninth part of the energy contained in the gas.

As Herr Dettmar has elected to base calculations on statistics provided by manufacturers, Herr Schäfer has followed his example; but owing to the large number of firms making gas apparatus, and the short time at disposal, the figures thus procured are incomplete. Even so, however, they show that the apparatus supplied in Germany during 1906 for the production of gas greatly exceeded, both in number and capacity, that supplied for the generation of electricity, and, indeed, that the private plants laid down to make gas of one kind or other greatly exceeded the capacity of the private electricity plants. For instance, some of the best known firms supplied between them more than 1200 different plants for the production of coal gas or water gas; five of the best known air-gas firms supplied more than 900 plants between them; and, according to an authority on acetylene, some 1100 new private generators were installed during 1906. Besides these, numerous oil-gas plants were erected for railway lighting; many installations of Selas lamps were fitted in factories of one kind or other; and a number of "Blaugas" plants were sold, especially in Southern Germany.

For motive purposes, some of the most prominent engine builders of Germany supplied between them more than 3000 motors, having a total capacity of about 250,000 H.P., at least half of the engines, which developed four-fifths of the total energy stated, being driven by gas made in private plants. Thus the new gas plants erected during 1906 for the development of power were by themselves equal in capacity to one-third of the total private electrical plants laid down for the generation of both light and power. In the direction of heat production, one single firm erected more than 300 gas-producers, consuming on an average 12 tons of coal each per day, and therefore equivalent to the total production of about 450,000 H.P.; while other firms supplied between them 420 similar plants, having a total capacity of over 600,000 H.P.* Thus the total number of all gas-generating appliances installed during 1906 in Germany may be calculated to be at least 10,000; and their capacity to be at least 2,500,000 H.P. The importance of the private plants cannot fairly be depreciated in the manner adopted by Herr Dettmar, on the assumption that they are used for very short periods of time. A private electrical installation may well run for only 1500 hours per annum, as he assumes; but many pressure and suction gas engines work for eleven or twelve hours a day—*i.e.*, for 3300 or 3600 hours per annum—while the gas plants installed to serve factories frequently run day and night without interruption throughout the entire year.

Not much satisfaction can be derived by the electricians from the claim that the number of new public electricity supplies erected each year exceeds the corresponding number of gas undertakings, if the term public supply is interpreted reasonably. In his first article Herr Schäfer said that 70 or 80 new gas supplies were inaugurated in Germany during 1906. The true number was over 100, and none of them was smaller in capacity than 1000 standard lights. The most recent tables published by the "Elektrotechnische Zeitschrift" include many so-called public electricity supplies which feed fewer than 100 standard lamps, and dozens which provide current for fewer than twenty. These are but undertakings where a man generates current for himself and a neighbour, lights his foremen's houses as well as his own factory, or where a railway station or public building is fitted for electric lamps.

On the whole, therefore, no unprejudiced person can dispute the accuracy of the conclusions previously arrived at by Herr Schäfer, to wit: (1) Gas is much more widely used in Germany than electricity. According to a conservative estimate, its individual places of consumption—houses, flats, shops, &c.—are at least eight times as numerous. (2) Much more energy is distributed in the form of gas than in the form of electrical current—according to a conservative estimate, at least ten times as much. (3) The number of individual consumers, and the amount consumed (calculated in terms of energy), are both growing much more rapidly in the case of gas than of electricity.

The Comparative Dangers of Gas and Electricity.

Although in the first part of his article Herr Dettmar admits that the comparative extent to which human life and property are endangered by the use of gas and of electricity respectively cannot be judged from the absolute number of fires or explosions which take place, in the second part of his contribution he quotes numerous absolute figures relating to fires, extracted from the returns published in such cities as Berlin, New York, Chicago, and London, and bases his further remarks upon them. Moreover, in spite of his academic admission as to the propriety of correcting all absolute statistics for the relative extent to which gas and electricity are respectively utilized, he brushes aside as "quite untrustworthy" all the calculations made with that object by Herr Schäfer whenever the results appear favourable to gas, while accepting as obviously true all results obtained by similar treatment of the original figures when they appear favourable to electricity. Based on incorrect or uncorrected data, the claims he makes respecting the comparative danger of gas and electricity are accordingly invalid; but some of them are sufficiently noteworthy to invite positive refutation.

Herr Dettmar rejects as unreliable all the figures contained in the reports of the fire insurance undertakings which record the number of fires "known" to have been caused by electricity. He does not trouble to consider them at all, but selects from the figures respecting those which are "believed" to have been due to current two particular fires which he asserts were obviously not electrical, inasmuch as the lights in the buildings that were destroyed were in perfect order at the instant of the conflagrations. Whether or no this last fact proves that the fires were non-electrical is matter of dispute; but, as in his calculations Herr Schäfer employed only those fires and explosions which are actually "known" to have been electrical, the precise mechanism of the other fires which are only "believed" to be electrical is not of much moment. On the ground that the two fires mentioned may have been inaccurately classified, Herr Dettmar passes over the whole of the figures that were issued by the Royal Statistical Office in Prussia relating to the extent of the pecuniary loss caused by fires. These figures, however, show without possibility of contradiction, that during the five years, 1899 to 1903, electrically-produced fires did more than 2½ times as much damage as fires caused by gas.

As the statistics formerly issued by the "Private" Fire Insurance Companies of Germany ceased to be published in 1900, and those issued by the "Public" Fire Insurance Societies ceased to be published in 1901, Herr Dettmar argues that they cannot be employed in comparing the dangers of gas and of electricity in view of the fact that electric installations have begun to exhibit their present "high immunity from fire" since that date, owing to the very strict regulations for the construction of such plants which were drawn up by the German Association of Technical Electricians in the year 1896. Herr Dettmar appears to forget that special rules for the purpose were issued by the Magdeburg Fire Insurance Company so long ago as 1883; analogous codes being published by other companies only a few years afterwards. Furthermore, Herr Dettmar ignores the fact that the compilation and publication by fire insurance authorities and by electricians themselves of such highly detailed and very stringent codes of rules for controlling the method in which electrical installations must be constructed amply demonstrates how much caution must be employed if an electrical installation is to be wholly free from danger to property and life. Herr Dettmar's impression that electric installations have become particularly safe in respect of fire risks since the year 1900, is proved to be false by the figures contained in a pamphlet entitled "Twenty-five Years of Prussian Fire Statistics" recently issued by the Public Insurance Societies. The data given are based on the returns of the Royal Statistical Office in Berlin, and show that the fires caused by defective electrical conductors have risen during the brief period of five years to more than 150 per cent. of their original number. Thus: 1900, 78; 1901, 97; 1902, 124; 1903, 106; 1904, 147; 1905, 199. Herr Dettmar states that during 1906 there were 3843 fires in London, 105 of which were caused by electricity and 405 by gas. As they stand, these figures are valueless, being absolute; but they are susceptible of correction for the comparative number of persons consuming gas and electricity. During the year 1906, the 31 electricity supply undertakings of London possessed between them about 80,000 customers; whereas the three largest gas companies possessed 895,320 customers, while the other twelve suburban gas-works supplied 297,454. Hence one fire broke out for every 760 electrical connections, and one for 2220 gas connections; in other words, the fire risk in London was more than three times as imminent in the case of electricity as in that of gas. Herr Dettmar's absolute figures relating to New York cannot be checked; but it is interesting to note that in "the metropolis of electric light" the largest gas-works of the whole world is just now being built, and will exceed in capacity the combined dimensions of all the public coal-gas undertakings in Germany.

But the most deadly thrust dealt by Herr Dettmar at the gas industry is the statement that matches are required where gas is consumed. In Herr Schäfer's original paper figures were given of the number of fires caused by children under the age of 12 playing with matches; and Herr Dettmar seriously argues that a large proportion of these fires were actually due indirectly to the use of gas. Gas, he says, is consumed from permanent fixtures situated in dwelling rooms where children congregate, and matches must be used there to light the burners. Paraffin and spirit lamps are taken into the kitchen to be cleaned, are lighted in the kitchen, and are brought alight into the dwelling rooms, the matches remaining in the kitchen. Children playing with matches may well have caused some twenty-five times as many fires as those due directly to the use of gas; but in reality, so Herr Dettmar argues, a very large proportion of fires attributed to matches should be ascribed to gas. The statistics of the Public Fire Insurance Societies, however, show that during the five years 1898 to 1902 more than two-thirds of the accidents caused by matches occurred in the open country, just where the least gas is used; whereas but few accidents of the kind occurred in large towns, where the consumption of gas attains its maximum. In the year 1902, as many as 3656 fires caused by matches broke out in the country, and only 55 in Berlin.

Again, the fire chart published by the same Societies for the

* It should be understood that these figures refer to gas-producers, which are distinct pieces of apparatus. They do not include such as are integral parts of furnaces, although fire insurance officials have to consider the latter as well.

whole of Germany during the years 1887 to 1901 demonstrates that the largest proportion of fires caused by children playing with matches occurred in West Prussia, where there were fewer than 20 gas-works in operation; the smallest number occurred in the Rhine Province, where the gas undertakings exceeded 200. In the light of these facts, no unprejudiced person can trace any connection between the effects of children playing with matches and the use of gas, more particularly when it is remembered that matches are perfectly indispensable, even in houses supplied with electricity. Far less untenable than the assumption that a large proportion of the fires cursorily attributed to children in this way are primarily due to gas, is the inference that very many of the fires whose origin has escaped detection are actually brought about by electricity. It is characteristic of electricity that fires break out at times and in places where no one imagined a danger to lie. Expressed as a proportion of the total fires notified in the districts covered by the Public Societies, the number of fires due to unknown causes is over 27 per cent.; the percentage itself increasing by about 30 per cent. in urban districts, but only by about 1·5 per cent. in the open country during the lustrum 1898 to 1902.

Herr Dettmar denies Herr Schäfer's statement that the proportion of accidents on electricity works is greater than that on gas-works, but submits no figures to the contrary. Strangely enough, the number of fatal accidents during the year 1907 has been not only relatively, but actually, greater on electricity works than on gas-works. Herr Schäfer has no desire to labour this point, for the figures relating to the accidents are too small to be of general importance.

At the end of his article, Herr Dettmar gives voice to the pious aspiration that statements respecting the danger to life and property inevitably accompanying the use of any artificial illuminant or heating agent should be eliminated from all documents of an advertising character (electric as well as gas) placed before the general public. He proceeds to argue that the proper method of drawing attention to the merits of gas and electricity is to lay stress upon the relative economy, convenience, and hygienic value of the two forms of energy. If the electricians find any difficulty in amassing the requisite data for the presentation of a fair statement of the case, they may be referred to numerous treatises already published showing how gas manufacture may be conducted profitably in towns having so few inhabitants that the erection of an electricity supply station is impossible unless some manufacturing operation requiring much energy is carried on locally. In a hygienic direction much valuable information will be found in the lecture delivered during the past summer before the Institution of Gas Engineers by Professor Vivian B. Lewes,* in the course of which the author demonstrated that the atmosphere of a room occupied by only one or two persons remains as pure when the illuminant is gas as it does when electricity is adopted; whereas in the presence of a larger number of human beings, the purity remains much higher when gas is employed—the air eventually containing far less of that inorganic matter which collects so rapidly where the illuminant is electricity, and is so prejudicial to health.

As the general result of the whole discussion, the two following propositions are incontestably established by statistics: (1) That the use of gas is much more extensive, and is growing much more rapidly, than the use of electricity; (2) that the danger to life and property incurred by the use of gas is always proportionately, and often absolutely, smaller than when electricity is utilized.

* See "JOURNAL," Vol. XCVIII., p. 918.

The American Coke Industry during the last three years has been marked by a steady decrease in the consumption of coal per unit of coke—due for the most part to the development of bye-products manufacture, in which the yield of coke from the coal is considerably greater than in the beehive oven. The figures for the year 1906 (the latest published), compiled for the United States Geological Survey by Mr. E. W. Parker, show that the total value of coke produced was $91,600,000, the average value per ton being $2·52.

Gas-Engines for Pumping Installations.—In a specially contributed article published in the "Glasgow Herald" on Tuesday, the following statement was made: "It is not quite generally known that gas-engines, in combination with suction gas-producers, are well adapted for the driving of pumping installations. Some figures in this connection have just been published by the 'Engineering Journal' of the University of Birmingham. At a small water-works at Welwyn, Herts, the duty per hundredweight of Welsh anthracite equalled 102,537,000 foot-pounds, which, seeing that the pump-horse-power was less than two, is cited as a remarkable result. In a larger installation by the East Kent District Water Company at Snodland, a duty of over 170,000,000 foot-pounds per hundredweight of Welsh anthracite was obtained. The pumps were driven by two 29 B.H.P. gas-engines, in combination with suction producers. On a still larger installation at Stourbridge, where suction gas is also employed, a duty of 216,000,000 foot-pounds per hundredweight of anthracite was obtained. On a pumping installation at the Paris-Plage Water-Works, Etaples, the fuel used is gas coke, and the duty per hundredweight of coke (allowing for partly consumed fuel in generation) works out at 117,000,000 foot-pounds, or, deducting cinders, at 128,000,000 foot-pounds."

YORKSHIRE JUNIOR GAS ASSOCIATION.

The members of this Association gathered together in goodly numbers at the Leeds Institute on Saturday to hear an address from their President, Mr. J. H. Hill; and interest in the occasion was quickened by the announcement a week ago of Mr. Hill's appointment as Secretary and Manager of the York United Gas Company. Mr. Hill's professional position, his years and experience, and his many activities in public and semi-public work outside the range of purely business interests, all give him a right to assume the *rôle* of young men's adviser. He is always gladly heard in this capacity, and the forcefulness and sincerity of his utterances add weight to his message. The merry flow of wit and raillery with which he treats his subjects, and his whole-hearted enthusiasm in upholding gas interests, make his speeches always welcome; and enjoyment runs high as one hears him going fearlessly full-tilt against any anti-gas speaker or writer, however eminent. The presence of spots in the sun may be admitted; but any inferiority of gas compared with electricity, or any hastily assigned limits to its usefulness and convenience, are not allowed to go unchallenged in his hearing.

His address (a full abstract of which is given below) was intended to include some remarks and experiments in connection with gas in its relation to ventilation; but the day before the meeting Mr. Hill found that they could not be carried out in the room allotted for the meeting. Though one strikingly fitted-up experiment was shown, and in his remarks subsequent to the vote of thanks and congratulation Mr. Hill referred at some length to recently reported utterances relating to ventilation, any report of these is reserved, as it was understood that Mr. Hill will deal with the matter at length on some occasion in the near future.

PRESIDENT'S ADDRESS.

The President began by referring to the ever-increasing difficulty, in these days of multiplied Associations, of fixing upon a line of ideas for a presidential address. But he thought that, in the case of an Association of Juniors athirst for education, nothing could come amiss if it was the outcome of experience, and threw light on the pathway of advancement. He then went on to say that to his mind the greatest want of our times is to cultivate a right judgment. We need to make a good choice at every epoch in life; but the formation of a habit of wise decision belongs to early manhood. Mr. Newbigging was right when he told them, at Manchester, that they had no time for "dominoes and cards." What he meant, of course, was that recreation must be subordinated to education. Nothing gave him (the President) greater hope for the success of the Junior Associations and for the future of the gas industry than the thought that watching football had less fascination for the majority of the younger men than hearing facts about their vocation in life. He was certain that the side on which they had ranged themselves was the winning one, let their individual success be what it might. Then it was necessary to make a wise choice of companions. More people missed their way by following a false guide than by deliberate deviation from the right course. It was well that they should bear in mind the words "fellow-students" with which Mr. Newbigging opened his address to them. They wanted to make their Association, as much as possible, a fellowship. In all societies it was advisable to associate, as far as they would allow, with those higher than ourselves. Landor had put the matter plainly: "If men would permit their minds freely to open to each other—to meet one another with smiles and frankness instead of with suspicion and slyness—the common stock of wisdom would be centupled." To multiply their stock of wisdom by a hundred would certainly be a grand achievement for the Association. He trusted it might be multiplied at least by ten during his year of office, as it well could be if each member would contribute his fair share to the general fund; for wisdom was not measurable by three dimensions like gas in a holder, nor was its stock limited by the number of lifts. Every lift they gave to wisdom only enlarged the capacity and made room for more; the bigger the outflow, the larger the stock. "Thou that teachest another, teachest thou not, at the same time, thyself?"

Passing on to deal with the range of selection, the President pointed out that in most things it is somewhat limited; but that in studies connected with gas manufacture they had a wide scope, thanks to technical classes conducted by teachers of the high type of their fellow-member, Mr. Cranfield. In his (the speaker's) younger days, text-books and the Technical Press were all they had. Even then, however, these were ample. Now with Free Libraries everywhere, and cheap issues of standard works—to say nothing of the verbatim reports and reprints of papers read before the various Associations and their own valuable library—the most thirsty soul could "drink deep of the Pierian spring;" or, to "gasify" the metaphor, the mind with the greatest demand had access to an "ungoverned" supply. This superabundance of good things to select from, however, only, he said, enhanced the value of right guidance. They must remember that "All is not grist that comes to the mill." The aphorism, "Know something about everything, and everything about something," was sound, as far as it went. At the beginning of a business life, they could give their studies too wide a sweep. When he left school to go into the gas office at York, his master gave him a piece of wise advice: "Don't think

that your interests rest solely in the books you have to keep. Take in all the knowledge you can of whatever is going on in the works." Having profited by this advice, he passed it on to his hearers. He advised them to "know something about everything" belonging to gas, until they had determined along what lines their capabilities led them. He remembered how he made the discovery that freehand, geometry, perspective, and draughtsmanship were all more within his powers than chalk-drawing or painting. There were other things besides drawing which he tried and in which he soon came to his limits; but he mentioned this particularly because the hand was the determining factor. All real knowledge came by manipulation. A few oft-repeated and well-verified facts were worth far more than a University degree based on book-knowledge only. "Properly speaking," said Carlyle, "there is no other knowledge but that which is got by working with the hands. The rest is yet all a hypothesis of knowledge—a thing to be argued of in schools, a thing floating in the clouds, in endless logic-vortices, till we try it and fix it." He (the President) supposed Carlyle meant first in the mind. It was well, as Mr. Sutcliffe had told them, to have their information recorded in a book, and well arranged in systematic form; but it was better to have it securely stored in the archives of the memory, as they might want it urgently some day when they could not consult their book. Nothing fastened facts so firmly together as the experimental working of them time after time. Information, unlinked to imagination, was like a glass eye—all for show and nothing for use. The optic nerve, linking the eye to the brain, was the essential which was lacking. Not what they saw with the outward eye availed anything, but what was laid bare to the inward vision. They might see coal put into a retort; but only the mind's eye could perceive the process of carbonization. In fact, gas making, being throughout a chemical process—as also indeed was gas consumption—they could not take any part in the business without engaging in manipulations that were scientific. On every hand problems were awaiting them to be pondered over and patiently experimented upon. If they would exercise their minds while they used their hands, they would clarify their mental vision; but they must take care to systematize their thoughts. It had been well said that "in a disciplined mind knowledge exists like vital force in the physical frame ready to be directed to tongue, hand, or foot—hither, thither, everywhere, and for any use desired." There was a woeful waste of mental energy everywhere—"unaccounted-for" wisdom. In whatever position they might be thrown by a turn of Fortune's wheel, they would, if they had duly disciplined themselves, pass currency like a Manx penny, and have a leg to stand on.

Honour and shame from no condition rise;
Act well your part, there all the honour lies.

At school they used to sing something about making it their pride to be the best of all cobblers or tinkers. It was a very good motto to take with them through life: "As I am a gas man, I'll make it my pride the best of all gas men to be." No man could be equally perfect all round. They should find out what they were fitted for, and then bend their energies in this direction as occasion served. "Know everything about something" was easily said, but impossible of attainment. Yet it was wonderful how, as time went on, this habit of segregation, or selection, led to aggregation, or accumulation; just as naphthalene crystals formed in a gas-main, when one particle fixed itself others were quickly attracted and attached to it until the whole pipe was blocked. In every quarter there sprang up a source of knowledge for the specialist. While he could never reach the point at which he could say he knew "everything" about his subject, he was ever advancing nearer to it. As bearing upon this question, the President mentioned that he had lately had his attention directed, luckily or otherwise, more towards the distribution and uses of gas; and among other aspects of this increasingly important part of their business he had considered the facts of ventilation. Twenty years ago, he gave a lecture, with experiments, before the York Architectural Society, on "Gas and Ventilation." This essay was amplified and brought up to date in the paper he read before the Association in 1904.

In this affair of experiment, however, the President said a word of counsel might not be out of place. They should not wait until they could purchase a complete outfit of gas apparatus. William Murdoch's first attempts at gas making were conducted with an old kettle borrowed from his mother. All his (the speaker's) earlier work was done by the simplest of means. He would recommend them never to buy ready-made what they could make for themselves. If they could only obtain access to a lathe, they should make the most of it. They had probably heard how Murdoch was said to have procured an entrance into the service of Boulton and Watt, at their Soho Works, Birmingham, through having turned his wooden hat in a lathe; and the result was the birth of the gas industry. Nowadays it was not necessary that a gas manager should be of an inventive turn of mind; but he must have, as part of his mental outfit, an inventor's insight. In every part of a gas-works there were scientific novelties. Perplexing problems in carbonization, such as their grandfathers knew nothing of, were presented to them for elucidation. Rival systems clamoured for favourable recognition. One that was easy to work was preferable to another, however superior it might be in results, if it was continually getting out of order. It was futile for an engineer to design and build elaborate works which neither he nor anybody else could get workmen to carry on satisfactorily. In the last resort, it was the human element which was the determining factor; and all their studies were vain if they omitted to form a right estimate of themselves as compared with others. They must think of others as they would have others think of them. Mr. Fligg, therefore, rightly warned them in his address not to "become too obstrusively conscious" of their "knowledge, attainments, and abilities." On the other hand, they must not be too diffident. Mr. Newbigging had wisely adjured them not to "accept unreservedly any man's *obiter dicta*." "Bring to bear upon them," said he, "your practical experience and thought and knowledge, as far as these enable you to form a judgment." Then Mr. Sutcliffe, in his admirably argued paper on the "Hygienics of the Gas-Stove," ventured to dissent from Mr. Lewis T. Wright in some of his conclusions.

He (the President) pleaded this example in extenuation while he concluded by criticizing Professor Silvanus Thompson. In his able lecture at the meeting of the British Association in York last year, he took as a text "Light without Heat;" and this was what he stated: "When we want a light at night, we do not want heat; yet we never get more than a small proportion of light rays by any artificial means of illumination. The greater part of the energy employed is developed into heat rays. Therefore electric lights are better than gas lights, and the mercury vapour lamp is best of all." Fancy that! Because the moon's rays were cold they were ideal. Where could the Professor have learned such vapourings? It smacked of the planet Mercury, or, at any rate, of some world other than the gas world. Luckily for gas lighting, this earth during the longest nights was coldest; hence, that lighting agent which was also a good medium for heating, in spite of all that sophistry could urge to the contrary, was best for this best of all worlds. They could safely make up their minds on that. He might paraphrase a well-known couplet and say—

Light may come and light may go;
But gas goes on for ever.

At the close of the address, the President was formally thanked for it; many appreciative remarks being made in regard to his onslaught upon Professor Silvanus Thompson for having ventured, in his British Association lecture, to startle the placid York air with heretical notions at the expense of gas. With simulated anxiety that all should secure fair play and hear both sides of the matter, one member promised to add Professor Thompson's printed lecture to the Association's library.

A vote of congratulation to the President on his recent promotion, after a service with the York Gas Company extending from the time he left school, was proposed by Mr. G. W. Fligg, seconded by Mr. W. Cranfield, and enthusiastically carried. The singular and gratifying coincidence was pointed out that within a few months two Presidents during their term of office and the Junior Vice-President had all been raised from the position of Assistant to that of Manager at their own works.

The members then discussed *in camerâ* the question (specially mentioned in the notice calling the meeting) of the proposal of the Manchester District Institution of Gas Engineers to invite the Institution formally to recognize the Manchester and Yorkshire Junior Associations, and bring all three into closer connection by giving the Presidents of the two Junior Associations a seat on their Council—their President and Secretary similarly joining the Councils of the Junior Associations. After full and frank discussion, the following resolution was passed *nem. con.*: "This Association wishes to put on record its appreciation of the kindly attitude maintained towards it by the Manchester District Institution of Gas Engineers, and the many kindnesses shown by individual members. It welcomes the movement towards official intercommunication and co-operation between the various Associations, and is willing to agree to the proposals embodied in the suggested new rule of the Manchester District Institution."

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

A Monthly Meeting of the Western District Section of the Association was held in the Technical College, Montrose Street, Glasgow, last Saturday evening.

The VICE-PRESIDENT (Mr. A. H. Whitelaw, of Glasgow), on taking the chair, explained that he did so because their worthy President—Mr. W. Wilson, of Falkirk—was unable to be present on account of a family affliction.

The first business was a suggested alteration in the rules.

The VICE-PRESIDENT, in submitting the proposal, said it was: (1) That the Council be increased from six to ten members; (2) that half of the Council retire every year, instead of the whole Council; and (3) that the annual business meeting be held at the end of the session, instead of at the beginning. He said his reason for desiring to increase the number of the Council was that it might enlarge the usefulness of, and interest in, the Association. More particularly, it led the way to the second part of the motion. At present all the members of the Council retired every year; and he thought it was advisable that some of them should remain in office. By holding the annual meeting at the

end of the session, the new Council would have time to submit the syllabus to the members before the next session began, instead of a month or so afterwards.

Mr. R. S. CAMPBELL (Provan) seconded the motion; and it was agreed to unanimously.

The following were elected the new members of the Council: Messrs. J. Frazer, of Provan; T. H. Whitehead, of Provan; D. Irvine, of Kirkintilloch; and J. A. Robertson, of Alloa.

Mr. T. H. WHITEHEAD (Provan) then read a paper entitled "Pumps: Their Construction and Use," an abstract of which, with the remarks thereon, will be found on p. 781.

RESUMED DISCUSSION ON CHARGING RETORTS.

The VICE-PRESIDENT called upon Mr. Myers to resume the discussion (adjourned from the previous meeting) of the question—

What method of charging gives the best results—light charges at short intervals or heavier charges at longer intervals?

Mr. J. NAPIER MYERS (Saltcoats) said that as he—somewhat inadvertently, perhaps—a month ago gave the members some figures on the subject, he thought it his duty to return that night. He remembered very well that when he stated the facts which he found in his experience, it brought to his feet Mr. MacLeod, who said he had never met with such results. If they would bear with him, he would recall the figures he gave a month ago. He said that, when working with four-hour charges, with one class of coal he got 9500 cubic feet of gas, and that when working six-hour charges, with the same coal, he secured nearly 11,000 cubic feet of gas. The idea might be that in Saltcoats they were able to get 1500 cubic feet of gas out of nothing; but his explanation would be that the result of the four-hour charges had been very far from perfection—that a portion of the charge, probably near the mouthpiece, had been indifferently carbonized. It was not an unusual experience to find a charge, when drawn, to have 18 inches of it in a rather tarry condition. When they worked six-hour charges, with lower heats, burning less fuel in the furnace, there was more time given for the heat to overtake the whole of the charge, and revivify the retort, so that when they opened it, and took the charge out, they had nearly 9 feet of retort in condition to work off the charge; and he would say that part of the loss they sustained with the smaller yield was recovered when working the longer charge. One of Mr. MacLeod's points was that the quality of the gas must be deteriorated. He had no difficulty, in experimental work, in raising a quantity of gas from any given quantity of coal—from 9500 to 11,000 cubic feet—but the quality fell proportionately. Well, their appliances for testing the illuminating effect were very innocent tools indeed. They tried to maintain the one standard by what was very well known to them all as the durability test; and while they sought to maintain durability, he was not prepared to say that the same level was maintained with both qualities of gas. It was near enough for all practical purposes; but if the gas had been tested carefully, upon a proper photometer, and by a skilled tester, probably there would have been considerable discrepancy. But in their rude way of doing it, it was not so serious as to make much matter. Of course, in making this admission, he most likely had given away his case altogether. For a considerable term of years he had obtained his coal supply from the same field. One of them was a whole-seam coal, which was not always of uniform quality. Of course, in a city like Glasgow, they could not deal with coal in the careful sort of way they were able to do in a little place. It was quite possible that, though he was working with the same coal in both series of tests, some of the six-hour charges might have got a shovelful of the cannel more than the four-hour charges; and this might be partly the explanation of the way in which they were able to maintain the same quality of gas. In the tests he made that summer (and he spent nearly the whole summer over them) there was one fact which was borne in upon him rather forcibly—that there was very little difference between the total profit, whether they were carbonizing at 9500 cubic feet or at 11,000 cubic feet. The extra fuel that was consumed to get the 11,000 cubic feet nearly used up all the profit which would accrue from the additional quantity of gas that they obtained per ton. The profit per 100 cubic feet when they were making 9500 cubic feet was 1·5d.; when they were making 11,000 cubic feet, it was only 1·6d. There was another point, not bearing upon this. They found in small operations, that they could maintain the quality of the gas in the summer time at their uniform level, without giving the same consideration to the quantity of cannel, very much easier than they could in winter time. To state it in another way, he had greater difficulty in putting in the necessary percentage of air in the winter, in order to facilitate purification by oxide, than he experienced in the summer. In summer he had no difficulty, working with the same coal, in putting in from 3 to 4 per cent. of air—thereby rendering the purifiers very much more efficient; and at the present moment, working the same coal, he experienced some difficulty in putting in 1 per cent. of air. He thought that the enriching effect which was found in small parochial operations, must be due to enrichment lying about the plant—in bends and arm-holes, and in various corners which were not properly swept out in winter; and that they obtained the benefit of this in summer.

Mr. J. MACLEOD said after Mr. Myers's full explanation, he (the speaker) found their views were really identical. If they increased the volume of gas, it was quite an axiom that they must decrease the illuminating power. If he might use as an example two nuggets of copper of equal weight, and they drew one out to 30 feet, and the other to 50 feet, they would not get two wires of the same thickness. The 50-feet length would be thinner than the 30-feet length. The same thing held good in carbonization. If they carbonized at a high temperature, they increased the quantity of gas, and they must also increase the percentage of hydrogen in it. At the higher temperature, they must break up the heavier compounds, and make them of a simpler and less illuminating nature. It was interesting to hear from Mr. Myers that, whether he took 9500 or 11,000 cubic feet of gas per ton of coal, the profit was nearly the same; and his explanation of this was quite apparent, and it was quite true. That they required a greater amount of fuel in order to get a higher yield of gas, was also a fact. The yield of tar and liquor would be less when he used a very high temperature. This would mean that he would in all probability get the same profit out of a high as out of a low yield. Modern practice was all towards getting a high yield of gas. In most English works they believed in doing so; and, of course, beyond a certain point, and where the illuminating power was tested with an argand burner, people in England were placed in quite a different position from those in charge of Scotch works, where they had to get a uniform quality of gas, and test this quality by a flat-flame burner. Once the flat-flame burner was finally discarded from testing-stations, it was certain that they would be in a quite different position; and probably the chance of securing a higher quality of gas from coal would be much greater than at present. Experimental plant was not perfect—very far from it; but Mr. Webster, who was present, he thought, would bear him out in saying that if they did not get within 5 per cent. of the results they obtained in the testing plant, he would be very seriously put about, and would want to know the reason why. He thought this would only show that any results he had quoted closely approximated to what were found in the gigantic scale of working required at the Provan Gas-Works.

Mr. J. WEBSTER (Provan) was very pleased with Mr. Myers last month, and also with his explanation that night. It was a certain fact that the higher heat they worked at, the more enrichment they had to put into the gas. He had been using less first-class coal that week than the previous week, when he was running higher heats and taking more gas per ton. As Mr. MacLeod had said, if he did not get, in the retort-house, within 5 per cent. of what was obtained in the testing-house, he had something to say. There was another interesting point Mr. Myers spoke about—the difficulty of keeping up the quality in winter, as compared with summer. This was a very marked problem in Provan, where they had large holders so much exposed. A cold day would send the illuminating power down; and he might have to put in two or three waggons of cannel. He might be getting 16 candles in the morning, and then, about 4 o'clock in the afternoon, when the sun was up, he might be obtaining 18 candles. He reckoned that this was the heat of the sun raising the light oils which were deposited on the water in the holders; and, of course, in one of their large holders, there was a large quantity of light oils floating about. In his experience, four-hour charges and high heats were the best to work with. He found the make of gas per mouthpiece to be in proportion to the make per ton. The more gas he took out of the coal, the more coal he got into the retorts, at higher heats. If the make per ton went down, the make per mouthpiece went down as well. At the same time, the fuel account also went down with the make per ton. When the heats were down a little, and the make per ton was down, the fuel account was also down. So that it was just a question whether or not it paid to take the last dregs out of the coal. Anything from about 9500 to 9600 cubic feet out of Scotch coal, was the full value. More than this he did not think paid.

Mr. MYERS explained that he tried to get 11,000 cubic feet, not because he liked it, but because his Directors liked it, and because, also, it was apt to be reflected in the wages.

Mr. WEBSTER wished also to refer to the difficulty in treating coal in large gas-works. It was a great difficulty, because they had so many kinds of coal—about sixty—to work with. The man in charge of the machine did not see the coal, and did not know what class of coal he might be getting. At one time, he might be having coking coal, and at another splint, which was quite different in the time it took to carbonize.

The PRESIDENT was quite well aware that a lot of fresh information had been brought out that night. But he had no hesitation in saying the subject was not exhausted. There was still a great deal that it was necessary for them to know on this matter. He was glad to hear Mr. Webster; but before he would feel convinced upon the subject, he would like to see, in tabular form, the yield per ton for charges carbonized for four and six hours, and the percentage composition of the gas, and the calorific nature under both conditions. There were many other things, besides, which might crop up. He would like also to know the temperatures in the bench and in the oven; and he had no hesitation in saying that there was one temperature, and one only—he did not know what it was, and it might not be known unless after making experiments—to bring out the maximum efficiency of the carbonizing plant. If anyone could come forward and give them figures upon these several points, he was sure he would benefit them as an Association.

A COMPARISON BETWEEN INVERTED AND UPTURNED GAS-LIGHTS.

An article by Dr. H. Krüss, of Hamburg, describing the results of numerous experiments upon the emissive powers of upright and inverted incandescent gas-burners at different angles, and suggesting various methods of comparing their behaviour from a practical as well as from a scientific point of view, was published recently. The following account of the author's processes and conclusions is derived from the text of his communication as printed in the "Journal für Gasbeleuchtung."

The plan of judging the efficiency of a burner from the illuminating power developed in a horizontal direction only was sufficiently trustworthy at the time when all burners were upright, because such burners all yielded their maximum light at or about a horizontal plane, while the proportion of the total thrown in other directions was generally similar. After the introduction of the inverted burner, conditions were changed—firstly because the latter do not emit their maximum light horizontally, and secondly because some fair method was required for comparing the duty and general utility of different inverted burners with different types of upturned burners. From a purely scientific aspect, the correct process is to effect a comparison on the basis of mean spherical illuminating power. In this way, gas-burners can be compared with electric glow and arc lamps, and data are afforded for estimating the proportion of the energy supplied which is converted into light. The argument of practical utility may, however, be adduced to show that comparisons should be made on the basis of lower hemispherical candle power, for it is descending light which is most serviceable. On the other hand, approached from the standpoint of the illuminating engineer, light sources are best compared according to the amount of illumination received from them by the surfaces that have to be lighted up. The latter method most nearly represents the conditions requisite in daily life; but, as the following examples prove, it yields different results from the plan of determining illuminating power.

Calculation of Spherical Illuminating Power.

The burners used by Dr. Krüss were, firstly, an inverted incandescent burner consuming 73 litres (2·6 cubic feet) per hour, tested inside a plain glass globe, the upper half of which was ground; and, secondly, an ordinary upturned incandescent burner consuming 130 litres (4·6 cubic feet) per hour. When the burners were run at the pressure of 13·8-10ths, the light they yielded in Hefners at different angles with the horizontal is shown in Table I.; the figures for the inverted burner being reproduced diagrammatically by the full line in fig. 1, while those relating to the upturned burner are similarly recorded in fig. 2. In order to employ these

Table I.—*Observed Illuminating Powers of Burners at Different Angles.*

Illuminating Power of Burner at	Inverted.	Upright.
90° above horizontal	—	19
75° " "	2	40
60° " "	10	58
45° " "	22	77
30° " "	31	92
15° " "	31	98
0° horizontal	38	99
15° below horizontal	45	91
30° " "	45	79
45° " "	45	59
60° " "	48	34
75° " "	49	7
90° " "	50	—

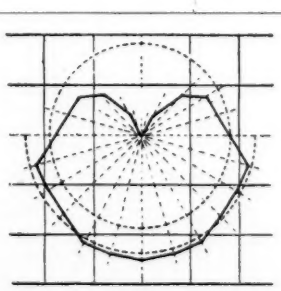


Fig. 1.

curves in the calculation of the corresponding mean spherical illuminating powers, the space each curve encloses when rotated about its axis of symmetry has to be calculated, and the radius measured of a sphere equal in cubical contents. It is not correct to take the arithmetical mean of the several photometric readings as is sometimes done, for the mean spherical illuminating power of any given source of light is the amount of light projected in any direction by an imaginary luminiferous object of equal total illuminating power which casts rays of equal intensity in all directions.

Monasch's formula for calculating mean spherical candle power ($I_\circ$) from the light emitted in the direction α, is

$$I_\circ = \frac{1}{2}\int_\circ^\pi I\alpha \,.\, \cos\alpha \,.\, d\alpha.$$

But since the individual measurements are only made at a limited number of angles, a modified formula is requisite. Taking the

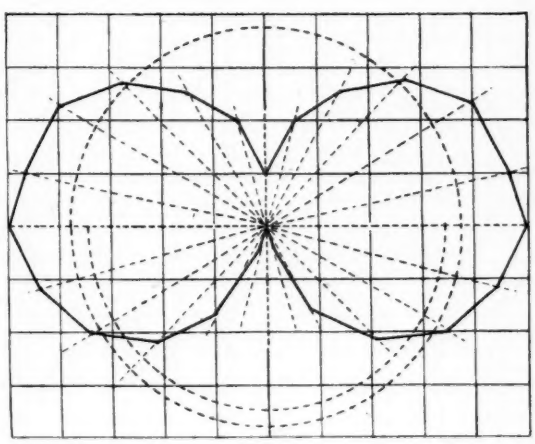


Fig. 2.

case of the burners actually tested at 15° apart, the light may be supposed to stand at A in the vertical sketch annexed (fig. 3),

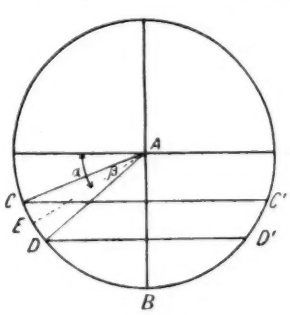


Fig. 3.

where the angle CAD is equal to 15° or β, and the angle formed by the horizontal plane and the line AE bisecting the angle CAD is termed α. Now the surface enclosed by the two parallel circles C C¹ and D D¹ is

$$4\,\pi\, r^2 \cos\alpha \sin\frac{\beta}{2},$$

the amount of light falling upon each unit of the surface is $\frac{I\alpha}{r^2}$, and the light received by the whole surface of the zone is

$$4\,\pi\, I\alpha \cos\alpha \sin\frac{\beta}{2}.$$

If the positions at which the light received is measured are all at the same distance apart—viz., β, the light falling on the whole sphere is

$$E = 4\,\pi \sin\frac{\beta}{2} \Sigma\, I\alpha \cos\alpha.$$

If the source of light emits the same amount of light—viz., $I_\circ$—in all directions, the illumination falling on unit surface is $\frac{I_\circ}{r_2}$; and the whole surface (equal to $4\,\pi\, r^2$) receives

$$E_1 = 4\,\pi\, I_\circ.$$

Hence, if E and E_1 are equal, the mean spherical illuminating power becomes

$$I_\circ = \sin\frac{\beta}{2} \Sigma\, I\alpha \cos\alpha.$$

With the aid of this formula, the figures relating to the two different gas-burners quoted in Table I. give the mean spherical and mean lower hemispherical values shown in Table II., where the data are also translated into British measurements. The same values are also plotted in the form of dotted circles for the mean spherical, and dotted semi-circles for the mean lower hemispherical, illuminating powers in figs. 1 and 2. It will be seen that the mean spherical illuminating power of the upright burner is twice that of the inverted, and that the consumption of gas per mean spherical candle power is 15 per cent. higher in the latter than in the upright burner. This is not to be wondered at

TABLE II.—*Calculated Mean Spherical and Lower Hemispherical Illuminating Powers.*

—	Inverted.	Upright.
Consumption per hour, litres	73·00	130·0
,, ,, , cubic feet	2·58	4·6
Mean spherical illuminating power, Hefners	37 10	75·80
,, ,, ,, ,, , candles	33·90	69·20
Duty, litres per Hefner	1·97	1·71
,, , candles per cubic foot	13·15	15·15
Relative consumption	115·00	100·00
Mean lower hemispherical illuminating power, Hefners	46·5	69·0
,, ,, ,, ,, ,, , candles	42·5	63·0
Duty, litres per Hefner	1·57	1·88
,, , candles per cubic foot	16·5	13·75
Relative consumption	84·0	100·00

inasmuch as the heat developed in the lower part of the flame in the upright burner assists in raising the temperature of the upper part of the mantle; whereas, in the inverted burner, not only is the mantle much shorter, but the heat acts only upon the burner itself. When only the lower hemispherical candle power is considered, the illuminating power of the upturned burner is once again seen to be greater than that of the inverted; but, on the contrary, the consumption per mean lower hemispherical candle is 16 per cent. less in the inverted than in the upturned burner.

THE ILLUMINATION AFFORDED BY THE BURNERS.

As already mentioned, when the practical value of different sources of light has to be compared, it is necessary to investigate the amount of illumination received from them by the surfaces which have to be lighted. A difficulty at once crops up in making the comparison, inasmuch as the burners are usually tested in a photometer room with perfectly black walls; whereas they are actually employed in rooms having ceilings and walls of considerable reflecting power. In view of the fact that walls and ceilings, &c., vary in their reflecting power according to local conditions, and also lose part of their original reflecting power as they become soiled, it seems preferable to make the comparisons of illumination in a non-reflecting photometer room in the ordinary fashion, neglecting the highly variable factor of reflection altogether. Experiments have been carried out on these lines by Dr. Krüss in order to ascertain the amount of illumination falling upon the centre of a horizontal surface at vertical distances of 0·5, 1, and 1·5 metres below the level of the light, and at horizontal distances ranging from 0 to 2·5 metres away from the vertical axis of the light, using the two burners whose illuminating powers have already been discussed. The apparatus employed was the illumination-meter described by the author five years ago, erected at the desired height above one end of a photometer bar, the graduations of which gave the required lateral distances. The results obtained are collected in the first half of Table III., where the data are left in their original form of metres (3·2 feet) and lux (1 lux = 0·085-candle foot).

TABLE III.—*Illumination Received by Surfaces at Different Horizontal and Vertical Distances from Burners (Observed).*

Horizontal Distance of Centre of Surface from Vertical Axis of Light.	Illumination Received in Lux.					
	Height of Source above Surface.					
	0·5 Metre.		1·0 Metre.		1·5 Metres.	
	Inverted.	Upright.	Inverted	Upright.	Inverted.	Upright.
0·0 metre	130·0	—	34·0	—	16·5	—
0·25 ,,	127·0	80·0	46·0	6·5	18·0	2·2
0·5 ,,	67·0	73·0	37·0	20·0	19·0	5·6
0·75 ,,	34·0	51·0	28·0	22·0	15·0	9·4
1·0 ,,	17·0	30·0	18·0	19·0	11·0	10·5
1·5 ,,	6·4	13·0	9·0	13·0	8·5	9·8
2·0 ,,	3·1	6·6	4·7	7·5	5·5	7·5
2·5 ,,	1·8	4·0	2·5	4·8	3·6	5·6
Mean Illumination Received by a Surface 5 metres in diameter	34·4	29·3	18·5	12·3	10·8	7·2
2 ,, ,, ,,	76·6	54·9	34·3	14·4	16·3	5·7
1 ,, ,, ,,	112·6	58·4	40·8	8·2	17 8	2·6

The lower portion of Table III. records the mean illumination received over the whole of a horizontal surface having one of the three diameters specified, when the centre of the surface lies directly underneath the light. The figures quoted for the mean illumination are deduced from the illumination received by the centres of the surfaces according to a process of calculation analogous to that previously employed for obtaining the mean spherical candle power from the individual photometer readings. The individual figures in Table III., which relate to the inverted burner, are plotted on the curves in fig. 4. In this figure, as in those which follow it, the general abscissæ represent the horizontal distances in metres of the centre of the horizontal observing surface from the vertical axis of the light. The uppermost curve shows the conditions obtaining when the vertical height of the light source is 0·5 metre above the observing surface; the middle curve represents the conditions when the light source is 1 metre above the surface; while the lowest curve represents the conditions when the light source is 1·5 metres above the surface. The ordinates in each case are, of course, the numbers of lux received. The heights of the horizontal dotted lines in each section of the diagram represent the mean illumination received over the whole of a horizontal surface having the radius expressed by the length of the dotted line—*i.e.*, by those surfaces which are covered by the figures in Table III. Fig. 5 is precisely similar to fig. 4, but relates to the upturned incandescent burner.

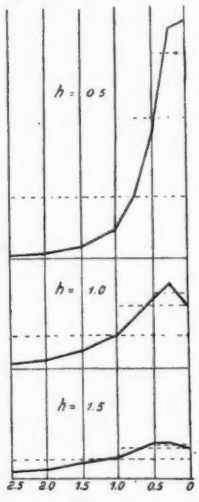


Fig. 4.

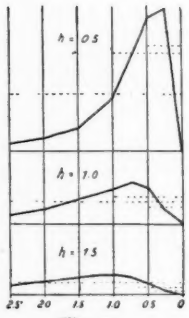


Fig. 5.

It is, of course, quite possible to calculate the amount of illumination received by horizontal surfaces in different positions with respect to the light by means of the emission curves in figs. 1 and 2. Fig 6 shows a light I at a vertical distance equal to h

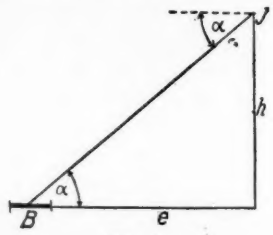


Fig. 6.

above the horizontal plane on which the surface B lies, the centre of the surface being at a horizontal distance equal to e from the vertical axis of the light. The rays of light from I impinge upon B at an angle with the horizontal equal to α. In these conditions, the illumination B received by the surface is

$$B = \frac{I\alpha}{IB^2} \sin \alpha = I\alpha . \frac{h}{IB^3},$$

$$\text{where } IB = \sqrt{h^2 + e^2}.$$

The values relating to the two burners under examination calculated in the manner described are shown in Table IV. On comparing Tables III. and IV., some notable differences will be found between the calculated and observed values. The explanation of

TABLE IV.—*Illumination Received by Surfaces at Different Horizontal and Vertical Distances from Burners (Calculated).*

Horizontal Distance of Centre of Surface from Vertical Axis of Light.	Illumination Received in Lux.					
	Height of Source above Surface.					
	0·5 Metre.		1·0 Metre.		1·5 Metres.	
	Inverted.	Upright.	Inverted.	Upright.	Inverted.	Upright.
0·0 metre	200·0	—	50·0	—	22·2	—
0·25 ,,	137·0	92·7	44·7	9·1	21·1	2·6
0·5 ,,	63·5	83·4	34·6	23·6	18·4	5 7
0·75 ,,	30·7	50·6	23·2	22·6	15·3	10·3
1·0 ,,	16 5	29·0	16·0	20·8	11·6	10·3
1·5 ,,	5·7	10·8	7·6	11·5	7·7	9·8
2·0 ,,	2·6	5 3	3·2	5·8	4·3	6·9
2·5 ,,	1·4	2·8	2·3	4·4	2·7	4·7

this lies in the fact that it is not always easy accurately to gauge the illumination at any angle α from the curves in figs. 1 and 2. It will also be noticed that the inverted burner gives much less light immediately underneath than it is calculated to do. The observed values are certainly correct, and doubtless the difference may be explained by the delicacy of the inverted burner and the variations in the state of incandescence to which the lower part of the mantle is brought.

It will also be seen that the agreement between the figures in Tables III. and IV. is the better the greater the oblique distance between the surface and the light. The reason for this increasing accord is that the illumination is calculated as coming from a single point; whereas the upturned burner especially has a glowing mantle of considerable dimensions. The figures show, moreover, that the upturned burner casts more light than the inverted burner upon surfaces lying at a considerable distance on either side of it, but that this advantage is the smaller the higher the light. Conversely, surfaces near to the vertical plane of the burner receive more illumination from the inverted than from the upturned light, while the mean illumination falling on surfaces of different diameters whose centres lie in the vertical axis of the light is also much greater when the light is inverted than when it is upright. It is frequently desired to calculate what volume of gas must be burned to afford a given amount of illumination, so that the relative expense of the different illuminants may be ascertained. When this is attempted, difficulties at once arise, because there is an uncertainty whether the calculation should be based on the figures for a large surface or for a small. Whichever plan is adopted, errors remain in the result, because neither burner can be turned down, but must be allowed to consume its normal quantity of gas. In the present connection, all that can be said is that the upturned burner consumes 4·6 cubic feet per hour and the inverted burner 2·58 feet, or only 0·56 times the amount. Thus the latter exhibits an economy of 44 per cent.; and the mean illumination afforded by the inverted burner is greater than that given by the upright.

Obviously, the inverted burner is even more preferable when several distinct units are employed. For example, if the burners are fixed 1 metre apart and the mean amount of illumination thrown by each (up to and including that burner which is 2·5 metres distant)* upon a surface at the stated vertical distance below them are added together, the total values in lux become:

Height.	Inverted.	Upright.
0·5 metre ..	172 ..	166
1·0 ,, ..	92 ..	61
1·5 ,, ..	53 ..	36

If the lamps are 1·5 metres apart, the mean illumination becomes more irregular; so that it is necessary to quote the maximum and minimum in each case. These are as follows:—

Height.	Inverted.	Upright.
0·5 metre ..	86–124 ..	90–113
1·0 ,, ..	61–63 ..	34–53
1·5 ,, ..	33–39 ..	21–31

On examining these figures, it will be seen that an inverted burner which exhibits an economy in gas consumption of 44 per cent. over an upturned burner, is always to be preferred; also that at vertical heights of 1 metre and 1·5 metres a horizontal surface receives the same amount of total illumination from inverted burners suspended at distances of 1·5 metres apart as it does from upturned burners only 1 metre apart. In other words, two inverted burners, consuming 5·16 cubic feet of gas per hour, are equally efficient with three upturned burners consuming 13·8 cubic feet; so that the former effect an economy of 63 per cent.

The Effect of Reflectors.

It may be objected to the foregoing comparisons that the burners were compared without reflectors; the upturned burner being employed with its chimney only, and the inverted burner with a globe which was ground at its upper part, but clear underneath. The effect produced by the application of a reflector may be deduced from the distribution curve. If $I_{\supset}$ is the mean lower hemispherical candle power, k_0 the factor by which it must be multiplied in order to convert it into mean spherical candle power, and $I_{\subset}$ the mean upper hemispherical candle power, then

$$I_0 = k_0 I_{\supset} = \frac{I_{\supset} + I_{\subset}}{2},$$

and

$$I_{\subset} = (2 k_0 - 1) I_0.$$

Hence the subjoined values in lux may be calculated—

	Inverted.	Upright.
Mean lower spherical candle power, $I_{\supset}$ . .	45 ..	69
k_0 . .	0·80 ..	1·10
Mean upper spherical candle power, $I_{\subset}$ . .	27 ..	83

In order to ascertain the exact results given by the two burners already examined, the author has tested them when surrounded with: (1) A conical reflector of opal glass 4 inches high, 2·4 inches in diameter at the top, and 9 inches diameter at the base; and (2) a plain hemispherical metal reflector 3·1 inches high, 10·5 inches diameter at the base, and having a radius of curvature of about 6 inches. The tests were carried out at the same different horizontal and vertical distances of the receiving surface from each light as before; the figures obtained being recorded in Table V. for the opal glass reflector, and in Table VI. for the metallic reflector.

Table V.—*Illumination Measured under Opal Reflector.*

Horizontal Distance of Centre of Surface from Vertical Axis of Light.	Illumination Received in Lux.					
	Height of Source above Surface.					
	0·5 Metre.		1·0 Metre.		1·5 Metres.	
	Inverted.	Upright.	Inverted.	Upright.	Inverted.	Upright.
0·0 metre . . .	144·0	216·0	38·0	67·0	16·0	25·0
0·25 ,, ...	128·0	130·0	38·0	47·0	17·0	22·0
0·5 ,, ...	65·0	90·0	35·0	38·0	17·0	18·0
0·75 ,, ...	30·0	54·0	24·0	31·0	14·0	17·0
1·0 ,, ...	16·0	34·0	15·0	24·0	11·0	15·0
1·5 ,, ...	5·3	13·0	8·3	15·0	7·5	11·0
2·0 ,, ...	2·6	7·0	4·2	9·3	4·6	8·5
2·5 ,, ...	1·5	4·4	2·3	5·9	3·2	6·3
Mean Illumination Received by a Surface 5 metres in diameter	32·8	45·7	16·6	23·1	10·1	13·8
2 ,, ,, ,,	75·7	100·0	40·9	38·4	15·5	19·3
1 ,, ,, ,,	116·2	150·5	37·2	45·7	16·8	21·8

Table VI.—*Illumination Measured under Metal Reflector.*

Horizontal Distance of Centre of Surface from Vertical Axis of Light.	Illumination Received in Lux.					
	Height of Source above Surface.					
	0·5 Metre.		1·0 Metre.		1·5 Metres.	
	Inverted.	Upright.	Inverted.	Upright.	Inverted.	Upright.
0·0 metre . . .	167·0	1850·0	52·0	420·0	19·0	204·0
0·25 ,, ...	140·0	113·0	68·0	143·0	19·0	15·5
0·5 ,, ...	63·0	63·0	51·0	36·0	22·0	75·0
0·75 ,, ...	30·0	41·0	26·0	21·5	21·0	24·0
1·0 ,, ...	15·0	24·0	16·0	17·0	14·0	10·0
1·5 ,, ...	4·7	10·0	8·0	10·0	6·9	7·6
2·0 ,, ...	2·3	5·3	3·9	6·2	4·3	6·1
2·5 ,, ...	1·3	3·0	2·2	4·0	3·0	4·4
Mean Illumination Received by a Surface 5 metres in diameter.	36·2	101	22·1	45·7	11·9	41·0
2 ,, ,, ,,	82·4	238	44·7	200·7	19·8	92·0
1 ,, ,, ,,	131·0	434	59·8	182·0	20·0	147·2

The results given in Table V. are incorporated diagramatically in fig. 7 for the inverted burner, and in fig. 8 for the upturned

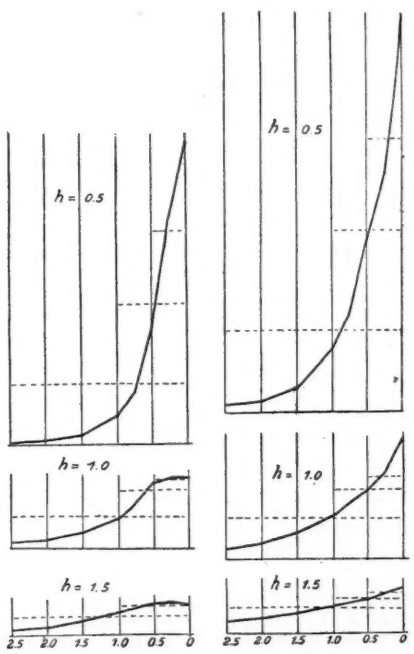


Fig. 7.

Fig. 8.

burner; while those which refer to the metal reflector in Table VI. are reproduced in fig. 9 for the inverted burner, and in fig. 10 for the upright burner.

The significance of the three curves and three dotted lines in each of these figures has already been explained. As might be

* The illumination reaching the surface from light sources at a greater horizontal distance away than 2·5 metres is negligible in quantity.

anticipated, the figures show that the application of a reflector to an inverted burner scarcely increases the light thrown by it vertically downwards. The opal glass actually employed, indeed, caused the burner to give a little less light underneath than it naturally did; but this may be explained on the ground that the reflector was not quite suitable and somewhat impaired the current of air round the burner. A reflector, of course, greatly increases the light thrown downwards by an upturned burner, and, indeed, causes it to be better than an inverted one. The results obtained with the metallic reflector are neither so useful nor so trustworthy as those given by the opal, partly because the influence of the metallic surface very largely depends upon

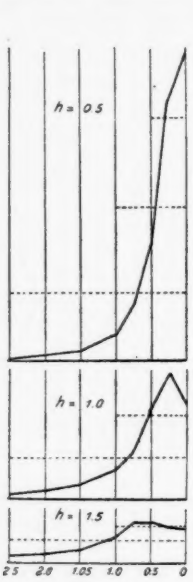


Fig. 9.

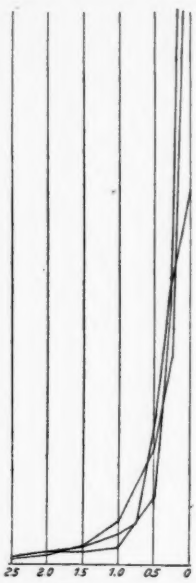


Fig. 10.

its state of cleanliness, and, secondly, because it causes the illumination to be highly irregular. For example, when the burner was 0·5 metre above the surface, the illumination directly underneath exceeded 1800 lux; 0·5 metre on one side of the axis, the illumination was only 63 lux; and 1 metre away it was only 24. A metallic reflector, indeed, acts as a searchlight, and may well be employed when an extremely bright light is required at a small spot, but is not at all suitable for the general purposes of illumination. If a surface 1 metre in diameter is considered—*i.e.*, such as that of a writing table—it will be seen that the inverted burner consumes about 44 per cent. less gas than the upturned burner, but that the latter affords some 30 per cent. higher mean illumination when employed under an opal reflector. In other words, for a given amount of illumination the upturned burner can be suspended at a greater height above the table so as to diminish the amount of radiant heat cast upon the surface.

When several units are employed suspended at distances of 1 metre apart, each under its own opal shade, the mean illumination received upon a surface at various vertical distances below the horizontal plane of the lights becomes:

Height.	Inverted.	Upright.
0·5 metre ..	168 ..	229
1·0 ,, ..	83 ..	116
1·5 ,, ..	51 ..	69

If the distance apart of the lights is 1·5 metres, the maximum and minimum figures are:

Height.	Inverted.	Upright.
0·5 metre ..	74–131 ..	117–165
1·0 ,, ..	55– 56 ..	77
1·5 ,, ..	33– 36 ..	45– 48

Comparing the results under the opal shade with those that were previously quoted for the unshaded burners, it will be seen that the shade has practically reversed their effect. Upturned burners placed at a distance of 1·5 metres apart yield practically the same mean illumination as inverted burners 1 metre apart; although the somewhat higher illuminations afforded by inverted burners when only 1 metre apart are considerably more uniform than those derived from upturned burners at the greater distance apart. Since two upturned burners consume 9·2 cubic feet of gas per hour, and three inverted burners consume 7·74 cubic feet, the economy of the inverted is about 16 per cent.; and therefore it is to be preferred before the upturned burner for such purposes as shop-window lighting where the arrangement mentioned might well be adopted. Naturally, the comparisons quoted as to the illuminating effect of the two burners may be seriously changed by the action of pale-coloured walls; but it nevertheless appears certain that the inverted burner is in many respects superior to the upturned burner, and represents a notable advance in the art of illumination.

In a subsequent issue of the "Journal für Gasbeleuchtung," Dr. Drehschmidt enters a strong protest against the conclusions drawn by Dr. Krüss in the preceding article between the efficiency of the upright and the inverted incandescent gas-burners on the ground that he used in his experiments a very old inverted burner, made by the "Gesellschaft für Hängendes Gasglühlicht," of such inferior type that it is no longer constructed. Modern inverted burners only consume about half as much gas as that stated by Dr. Krüss in the development of unit mean spherical or unit mean lower hemispherical candle power. The consumption per mean spherical candle power has, indeed, for some considerable time been reduced to a much smaller figure in inverted burners. Moreover, Dr. Drehschmidt considers that Dr. Krüss ought to have exercised more caution in using his opal glass shade over the inverted burner. The prejudicial influence of an unsuitable shade, by obstructing the removal of the combustion products, has already frequently been remarked; and it is well known that only such shades should be employed as leave plenty of room for the waste gases to escape above them. If Dr. Krüss's experiments were repeated under better conditions, it is probable that he would have cause to revise his statement that under a shade an upright incandescent burner is preferable to an inverted one.

In reply to Dr. Drehschmidt, Dr. Krüss admits that the results he has obtained apply only to the burners he employed, and states that he had no intention of using language which should convey the impression that the figures he obtained in the course of his research were of universal validity. Furthermore, he had no idea in his experiments of attempting to describe the present standpoint of incandescent gas illumination, desiring only to accentuate the fact that burners which afford such different polar curves as do upturned and inverted gas-burners cannot be compared by determining their mean spherical or their mean lower spherical illuminating power, and that the only method for valuing the inverted incandescent burner is one based on measuring the illumination received from it upon a surface.

Experiments on Wind Pressure.

The paper read at the meeting of the Institution of Civil Engineers last Tuesday was on the above-named subject; the author being Dr. T. E. Stanton, M.Inst.C.E., who dealt with experiments carried out at the National Physical Laboratory. Those described form the second part of the research on the distribution and intensity of the pressure of the wind on structures. General experience tends to show that in actual winds of which the velocity is not uniform over time or space, the mean pressure per square foot on a large surface is considerably less than on a small one. As a knowledge of such variation would be all-important in design, the investigation of this problem was made the chief feature of the new experiments. The method of observation adopted was the determination of the constant—*i.e.*, the pressure-velocity relation for pressure-boards of varying dimensions and for the models of structures. The results of observations on these boards—one 5 ft. by 5 ft., one 5 ft. by 10 ft., and one 10 ft. by 10 ft.—gave practically identical values of the constant in the pressure-velocity relation. In units of pounds per square foot and miles per hour, the mean value of this constant for the three boards was 0·0032. Further observations appeared to show that the cause of the higher value of the constant compared with that obtained in the case of small plates was the relatively greater intensity of the negative pressure at the back of the boards compared with that at the back of the small plates. Some experiments were also made on a model of a braced girder 29 feet long by 3 ft. 7 in. deep, and on a roof model of which the sides were 8 ft. by 7 ft. The results of the research lead to the conclusion that the resistance of a complicated structure in the wind can be accurately predicted from a determination of the resistance of a small model of the structure in an experimental channel.

North British Association of Gas Managers.—We have received the report of the proceedings at the forty-sixth annual meeting of the Association, held in Glasgow on the 25th of July last, under the presidency of Mr. Lawrence Hislop, F.C.S., of Uddingston. The technical matter is followed by the rules of the Association, the list of office-bearers and members, and the accounts; and appended is the "Statistical Report of the Gas Supply of Scotland" from July 31, 1906, to Aug. 1, 1907, by the Committee of the Association. As usual, portraits are given of the authors of the papers and of the President; and a reproduction of the photograph of the excursion party to Campbeltown the day after the meeting forms a frontispiece to the book.

Preparation of Illuminating Gas.—A process for preparing illuminating gas has been patented in the United States by Mr. W. H. Gartley, the Assignor to the United Gas Improvement Company, of Philadelphia. According to an abstract of the specification in the current number of the "Journal of the Society of Chemical Industry," the gas, on its way to the mains, is gradually cooled from the temperature at which relatively higher-tension vapours cannot remain in liquid form, to one corresponding with that in the mains. The condensation products of the hydrocarbon vapours are made to drop from cooler to hotter zones, and thus a continuous return of the high-tension vapours to the gas is secured during its progressive cooling. The relatively low-tension hydrocarbons which would condense in the mains are removed from the hottest zone, which is also superheated so as to vaporize the last traces of relatively high-tension hydrocarbons.

PUMPS:

THEIR CONSTRUCTION AND USE.

By T. H. Whitehead, of the Provan Gas-Works.

[**A Paper read before the Scottish Junior Gas Association.**]

It was not his intention, the author said, to deal with every known type and style of pump that was on the market, nor yet with every pump he might have had to do with. He would first of all refer to two tar and liquor pumps at the Provan Chemical Works, which had to prime or lift the tar and liquor made at the Provan Gas-Works. The two pumps were of the same dimensions—12-inch steam cylinders, 8-inch pumps, 12-inch stroke, horizontal, double-acting piston-pumps, made by Messrs. Joseph Evans and Sons, of Wolverhampton. The pumps were so connected together by pipes and valves that either or both could pump tar or liquor, as desired, and deliver into the respective store-tanks. On the suction side, where the work began, an 8-inch pipe was laid from the pump to the centre of the well, and to the bottom of it. Attached was a moveable arm or pipe, with a perforated nozzle at the end. By raising or lowering the nozzle, tar or liquor could be pumped at will, and at any depth. The distance from the pump to the centre of the well was 63 feet, and to the bottom of the well 26 feet; so that there was a lift of 26 feet, and a travel of 63 feet—a total length of 89 feet of 8-inch pipe of suction.

At the commencement of the use of these pumps, there was found to be a difficulty to get them to prime or lift the tar, particularly when they had been standing for a day or two. With the idea of getting over this trouble, a ½-inch pipe was laid from the top of the air-cushion on the pump to the liquor in the well, and also a ½-inch discharge-pipe from the other cushion back to the well. This arrangement, though a feasible one, hardly worked in actual practice; and ultimately a retaining valve was placed in the suction mains. The result was that, though the pumps might be standing for a day or a week, there was little or no difficulty in starting them at any time. From the pump the tar or liquor was delivered through 9-inch cast-iron piping. The distance it had to travel was 550 feet, with a lift of 45 feet to the bottom of the store-tank. The pressure against the pump, while running at 30 revolutions per minute, was 27 lbs. per square inch when the store-tank was empty, and about 40 lbs. per square inch when it was full. The piston-valve was specially constructed as a floating valve, cast hollow from end to end, and was, for the size of it, very light. Many advantages were claimed for this type of valve. The arrangement entirely dispensed with the two suction and delivery valves employed in a great many other designs of pumps; and it was not dependent on the fluid for its action. The passages in the pump were very large, to admit of the easy pumping of thick and obstructive matter. The loss and annoyance caused by pumps choking, and undue wear and tear, were dispensed with; and the breakage of valves was impossible. Every part was easy of access, and could be removed and replaced in a very short time. It was about 3½ years since these pumps were started; and the upkeep of them had been remarkably small. They reflected great credit upon those, in different parts of the country, who had been so wise as to adopt them. The variety of pumps suitable for gas and chemical works purposes was very large; but in this, as in many other cases, experience was the best of all teachers.

The pumps described were illustrated by diagrams; and the author proceeded to show upon the screen a number of different types of pumps used in gas and chemical works.

In the second part of the paper, a description was given of a vertical pump of smaller size, with a 6-inch steam-cylinder, a 4-inch double-acting pump, 7-inch stroke, and a height over all of 6 feet—made by Messrs. Worth, Mackenzie, and Co., Limited, of Stockton-on-Tees. The whole frame is one casting. This pump was shown fitted with Worth's patent-slide valve, which gives double the wearing surface, and makes a vast difference in the life and efficiency of the pump. Attached to the pump was an air-vessel. Air-vessels on pumps, when placed on the delivery side, the author said, should be at least from four to six times the displacement of the ram. Pumps worked better if an air-vessel were placed on the suction side also. The reason why the air-vessel was useful was because the elastic force of the air which became compressed in it caused the liquid to flow uniformly into the barrel, filling it more completely at each stroke. The air-vessel also prevented the bad effect arising from the percussive action of the liquid, as it was suddenly stopped and started at each stroke of the pump. It was three years since two pumps of this sort were installed at the Provan Chemical Works, for pumping the ammoniacal liquor into the concentrating plant. Only one pump was required; the other stood as a duplicate. The pump worked day and night, passing, on an average, 300 tons per 24 hours. The speed of the pump was 90 revolutions per minute, and the pressure on the delivery side 85 lbs. per square inch. A recorder was fixed to the pump, which was read every half-hour. A belt-driven tachometer was also fixed, showing at a glance at what speed it was running at any moment. To give some idea of the regularity with which these pumps worked, he showed a chart drawn about four times the size of the actual one; and for a run of 24 hours it was found that the pumps did not vary much in speed more than two revolutions in any half-hour—rather a good record, considering that there were no governors.

Discussion.

The President said the paper was a practical one, in every sense of the term. He was sure it must have entailed a great deal of labour, and have occupied much time, in its preparation.

Mr. R. A. Campbell was glad to hear that the tar and liquor pumps at the Provan Chemical Works were now giving no trouble in starting, because he knew that, at one time, there was great difficulty in starting them. He would like to ask Mr. Whitehead about the back-pressure upon the pumps. Mr. Whitehead mentioned that the back-pressure, when pumping tar, was 27 lbs. per square inch when the tank was empty, and 40 lbs. when it was full. He had gone into the matter roughly; and he made the back-pressure on the pump, when pumping tar, with the tank empty, 19 lbs. per square inch; and when the tank was full (that was, with 30 feet of tar in it), 33 lbs. per square inch. This was when the pump was at rest; and he would like to ask if the additional pressure was due to friction on the pump.

Mr. J. Napier Myers (Saltcoats) said the paper was of the character of those which disarmed criticism. He appreciated to the full the valve which was described as attached to the Worth pump. There could be no doubt that the application of this valve-face, covering the valve-seat so completely, would tend to wear out in a very uniform way. While it was a simple matter, like all great inventions, it was a complete way of getting over the difficulty of the unequal wearing of the surface. When Mr. Whitehead spoke about the trouble in priming the pump, and said that a pipe was connected from the air-vessel to the well, the thought occurred to him that it was a very improper thing to do, to drill holes and attach pipes to the air-vessels; and he noticed that, in all the pumps which were shown on the screen, no such dastardly act—should he say?—was attempted with any of the air-vessels. It was not a good thing to do, unless they had an air-pump; and he would like Mr. Whitehead to explain why he should have ventured on such a bold action as to drill a hole into an air-vessel. While he had no doubt that the ingenious contrivance of the adjustment of the suction-pipe to draw either tar or liquor would answer the purpose admirably, the difficulty which appeared to him in connection with it was that the joints caused several turns to be made in the stream of liquid; and when this was of a viscid nature, like the thick tar they had in winter, it would increase the friction in the flow of the material. Another style of appliance for doing the same work—he did not know that it was generally familar—was one which he employed in the tar-tank at Saltcoats. The tar-tank was an old gasholder tank; and changing it from a gasholder tank to a tank to hold tar and liquor, he employed one of the stand-pipes. He cut it half-way down, and surmounted the upstanding pipe by a hood, which was sufficient to reach as high up as the cover of the tank. With this telescopic arrangement of a hood covering the stand-pipe, by raising it up he was enabled to draw either tar or liquor at will. It was a simple device. Only the hood required to be suspended, either by a permanent block-and-tackle arrangement, or else by some kind of link, with holes in it, as he employed at Saltcoats. He had found this telescopic arrangement to answer his purpose admirably.

Mr. J. MacLeod (Kirkintilloch) remarked that he had had some experiences—some painful experiences—with old and prehistoric pumps; and he could appreciate the difference between these and pumps such as Mr. Whitehead had described, and which must be a pleasure to work with.

Mr. J. Smith (Provan) said Mr. Whitehead had mentioned the benefit to be derived from the use of an air-vessel on the suction side of the pump. It occurred to him that there was another thing which gave the knocking to the pump—namely, having the inlet-pipe too small. He had the impression that many pumps could have the knocking remedied by enlarging the inlet—having the inlet bigger than the delivery-pipe. This seemed to be a thing that was not generally recognized, for he had often come across instances in which the inlet-pipe was far too small.

The President, in proposing a hearty vote of thanks to Mr. Whitehead for his paper, said it was one of great interest. It was a practical subject; and Mr. Whitehead had shown, by the way in which he had handled it, that there was not much he did not know about pumps. Like Mr. Campbell, he (the President) had gone into some calculations about back-pressure on the delivery side of the pump. The figures he made out were: With a head of 40 feet, taking the tank empty, the back-pressure was 17·6 lbs. per square inch. Mr. Campbell made it 19 lbs., and Mr. Whitehead 27 lbs. With the tank full—that was, adding another 30 feet of head—he made the back-pressure 30·8 lbs. per square inch. This was taking into consideration that it was tar which was being pumped. At this point he found a difficulty; he did not know how much to add for friction. He looked up one of the books on the subject, and saw there that from one-third to two-thirds should be allowed for friction. He took the lowest figure, and added 33⅓ per cent., which brought out, with the tank empty 23·4 lbs., and with the tank full 41 lbs. This came more in line with the figures Mr. Whitehead had given them, and which, he believed, were right, because, if he mistook not, Mr. Whitehead did the most practical thing—he applied a pressure-gauge, and took his pressures accurately. Another point, which he was glad to hear Mr. Myers bring out, was that nobody should tamper with the air-vessel of a pump. That was doing a thing which was not correct. The air-vessel of a pump was there to contain air under compression; and therefore if they put on a pipe and increased the pressure, they would be adding to the value and efficiency of

the pump. The air-vessel was used so that, when the pump was at delivery, it might press the air, and when the pump was at suction the pressure of the air might continue the delivery, and thus increase the efficiency of the pump, by adding to the pulsive effect. And not only so, but also reduce the knock of the pump. Sometimes the air-vessels got filled with liquid, and it was necessary to stop the pump and run off the water, allowing the air once more to flow into them, and so get the benefit of the compressed air.

Mr. WHITEHEAD, after thanking the members for their kind remarks, said his statements about pressure against the pump were quite correct. When there was a lift of 45 feet, with the tank empty, and the pump running at 30 revolutions per minnte, there was really 27 lbs. to the square inch of back-pressure. In the calculations of the President about friction, it did not always work out according to rule, for the simple reason that there were so many bends, turns, and twists, which could not be taken into account; so they had to adopt practical means, which he did. He put on a pressure-gauge; and, of course, he was not many minutes in getting his results. In reference to the air-vessels which Mr. Myers spoke about, those to which he referred in his paper were not in his experience. The air-vessels and pipes were all arranged before he was at Provan. So, of course, why they were there was a question he could not answer, because he did not put them there. He had shown, in one of the views upon the screen, the vessel which they adopted. But different people had different ideas.

Mr. J. FRAZER thought that he could answer the question Mr. Myers asked about the pipes being put into the air-vessels. He was present at the starting of the pumps, and was one of the parties responsible for the putting of pipes into both the suction and the delivery side of the pumps. On the suction side the pipes were put in for the purpose of getting hot liquor from the still to soften the tar about the piston chamber, as they found it inclined to choke. On the other side, the object was to get rid of the air which was compressed in the inside; and he thought Mr. Whitehead might have told them that there were cocks fitted between the air-vessels and the pipes, which could be closed. This was before the existence of the non-return valve. It was a case of making the best of what they had.

Province of the Illuminating Engineer.—At St. Bride's Institute, E.C., to-morrow (Wednesday) evening, Mr. Leon Gaster is to read a paper on this subject, before the Association of Engineers-in-Charge. The chair will be taken by Sir William H. Preece, K.C.B., F.R.S.

Removal of Iron and Manganese from Water.—The very manifest advantages of drawing domestic water supplies from the deeper layers of the soil are insisted upon in the "Gesundheits Ingenieur" for the 16th ult.; but at the same time in many localities such waters contain, in solution, considerable quantities of iron and manganese, which interfere with their employment for most purposes. It is pointed out in the current Engineering Supplement to "The Times," that the chief difficulty is that water containing iron in the ferrous condition is, by exposure to the atmosphere, liable to have the iron salts present converted to the ferric state, in which case deposition of the iron takes place in pipes, cisterns, and reservoirs, and in some cases the water long remains opalescent and even becomes coated with an unsightly film. Moreover, such waters favour the growth of certain fungi, which lead to stoppages of the mains and in certain instances have so interfered with the supply as to entail the necessity for seeking water from another source. Plans advocated by Kurth and others for freeing water from iron are described.

"Transactions" of the Societe Technique.—We have received the volume of proceedings of the Société Technique du Gaz en France for the present year. It contains the report of the thirty-fourth annual congress, held at Nancy from the 11th to the 14th of June, under the presidency of M. André Coze, comprising the papers submitted and notes of the remarks to which they gave rise, an account of the visits, and reports of the discussions of the special subjects—six in number—submitted to the members. This, as our readers are aware, was a new feature of the Society's programme; and it contributes 64 pages to the volume. Most of the papers, which, as well as the President's address, are illustrated by diagrams, reproductions of photographs, and plates, have already been dealt with in the "JOURNAL." The description of the Nancy Gas-Works, which were visited on the first day of the meeting, is accompanied by views of the coal and coke handling plant and a plan of the works. A plan is also given of the iron foundry and steel-works of the Compagnie des Forges de Châtillon, Commentry, et Neuves-Maisons, visited on the third day. Accounts are given of the other visits, and of the excursion to Gérardmer on the 15th of June. Appended to the papers is an explanation by M. Lefebvre-Dibon of M. Georges Claude's coal-gas blowpipe; and also a discourse on electro-chemistry by M. Muller, of the Nancy Chemical Institute. The other matter composing the volume consists of particulars with regard to the Society's prizes, the awards to employees, the names of companies contributing to the funds of the Society, the rules, accounts, lists of officers and members, and of books, &c., in the library. M. Victor Delahaye reviews the legal business of the year 1905-6, and brings up to date his useful index to the cases contained in preceding volumes back to 1884. The book has been produced under the supervision of M. Payet, the Secretary of the Society.

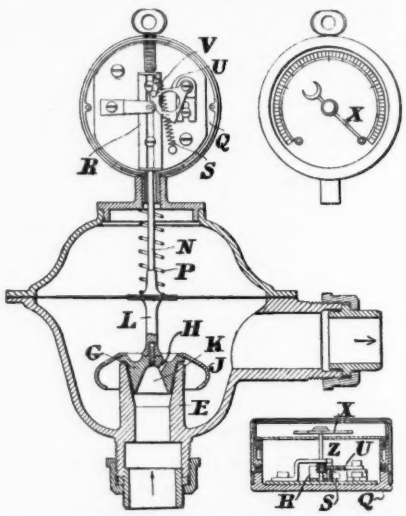
REGISTER OF PATENTS.

Indicating or Regulating Pressures of Gas.

SMITH, T., of Gospel Oak, N.W.

No. 26,097; Nov. 17, 1906.

This invention relates to means for regulating the pressure or supply of gas in mains, &c., or means for adjusting the pressure or supply—the said means being, if desired, connected and combined with means for indicating the pressure or changes therein, by means of a reservoir of gas fitted with a diaphragm of leather, rubber, or other material suitably treated in order to be readily influenced by changes of pressure in the gas. The diaphragm may be stretched across the centre of a chamber (spherical or of other suitable shape) in suchwise that the chamber is divided into two parts. Into one of the parts the gas is admitted through a pipe from the main, and through the other pipe the gas is led out of the chamber to its final destination—*e.g.*, to the pipes supplying the burners, &c., when the gas is used for heating or illuminating purposes. The inlet of gas into the chamber is capable of regulation by means of a valve of any suitable form, but advantageously, according to this invention, of the form shown.



Smith's Gas Pressure Regulator.

The inlet-pipe leads from the gas-main into the lower chamber of a vessel with a diaphragm dividing it into two parts, so that the lower portion is quite gas-tight. The pipe from the chamber to the gas-burners is at the side, as shown. Attached to the end of the inlet-pipe within the lower chamber there is an elongated portion E (internally coned at its end), into which fits a cone-shaped valve-plug G, which has a lateral flange J surrounding the pipe E externally. The lower end of the plug has a cavity K cut in it, and the vent H communicates from the cavity to the interior of the lower chamber. Attached to the upper part of the valve-plug is a rod L, which reaches up as far as the diaphragm, and is there attached to the rod N, which passes gas-tight from the upper chamber through the diaphragm. Round the rod N there is a spring P, bearing at its upper end against the casing of the upper chamber. The rod N itself bears, at its upper end, against the slide R, which is borne on the disc Q. The slide has a longitudinal groove or guide-way, by means of which it is capable of movement diametrically across the disc, and is guided by large headed screws fixed into the disc. The spring S normally presses the slide R against the upper end of the rod N. U is a tooth sector pivoted to the disc Q, and connected to the slide R by a link V; the teeth of the sector gearing with a toothed portion of the axis Z, which bears a finger X—the axis being borne by the bent arm T attached to the disc Q.

The gas, on entering the pipe E from the main, forces up the valve G and escapes between the conical sides of the pipe and the valve into the lower chamber; the flanges J and the cavity K moderating the flow of gas, while the vent H equalizes the pressure between the gas in the mains and that in the interior of the lower chamber, so as to prevent back-suction. As the gas flows through the valve G, the rod L is raised and the centre diaphragm bulges upwards against the action of the spring P. This carries upwards the rod N, which then bears against the slide R, moving it diametrically across the disc Q. The movement of the slide causes the tooth sector U to rotate about its pivot; and the sector, in turn, rotates the axis Z, to which the finger X is attached.

It will be obvious that the position of the slide R, as indicated by the position of the finger X, will be a measure of the position of the valve G, for, as the valve opens or closes, so will the slide move upwards or downwards respectively, and the finger X move over the scale.

Production of Ammonia.

WOLTERECK, H. C., of Victoria Street, S.W.

No. 28,963; Dec. 19, 1906.

In his patent No. 16,504 of 1904, the inventor described a process for the production of ammonia from peat by means of passing air and steam over or through it at a carefully regulated temperature. On executing this process on a large commercial scale, great quantities of tar, mostly consisting of hydrocarbon of the paraffin series, are

produced; and if the tar is carried through the different apparatus, it interferes with the purity and quality of the acetate of lime (which forms an important bye-product in the process), and also with the colour of the finished sulphate of ammonia. Further, a good portion of it is lost—being carried off by the escaping hot gases.

He has now found that, in passing the hot gases through a scrubber containing hydrocarbons of a high boiling-point the bulk of the tar can be dissolved and removed from the gases without any simultaneous condensation of water and consequent loss of ammonia. Such hydrocarbons, while hot, dissolve a great quantity of tar; and when saturated they solidify upon cooling. The hydrocarbons employed can be recovered by distillation and be used again for this process.

By keeping the hydrocarbons at a sufficiently high temperature, condensation of water is said to be obviated. From time to time, it is pointed out, they should be examined until a drop removed from the apparatus will solidify on cooling, and so the fact of their saturation be established.

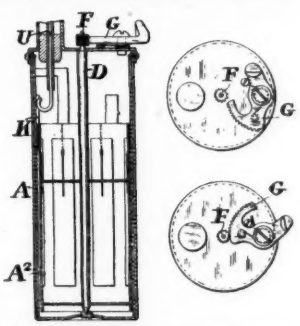
Apparatus for Lighting Gas.

NEHMER, H., of Clifton Street, Finsbury, E.C.

No. 29,123; Dec. 21, 1906.

This invention relates to improvements in patent No. 6231 of 1895, for static machines to light gas.

Instead of employing a wheel for rotating the inner cylinder, the patentee only uses a small segment of the cog-wheel, with a lever so that the segment can be moved by pressure of the thumb; and, instead of providing the outer cylinder with an insulating disc by means of which the contacts are made, the connecting bridge is fastened in a semi-circle to the inside of the outer cylinder—the contact between the spire and the strip of tinfoil being made by direct contact.



Nehmer's Electrical Apparatus for Lighting Gas.

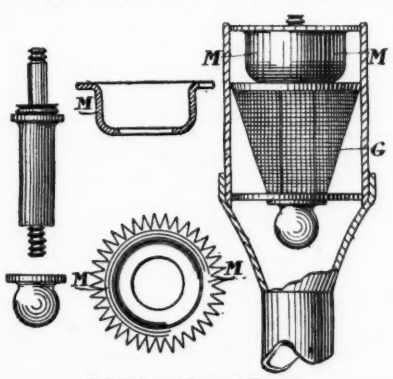
The pinion F of the spindle D, when resting, is interlocked with the toothed segment G; but when pressed forward, it relieves the pinion and permits the cylinder A^2 to rotate freely. Toothed segments or racks engaging with pinions have been employed to rotate electrical apparatus for lighting gas; but such gear has not been designed to permit of the rotating part revolving freely. As it is possible to do away with the insulating disc, the wire U is brought in direct contact with the tinfoil K, as shown.

Incandescent Gas-Burners.

COLE, H., of Birmingham.

No. 19,555; Aug. 31, 1907.

In patents No. 19,776 of 1900, and No. 11,788 1904 (granted to James Mallol), improvements in burners were described in which an inverted cone-shaped member, or inverted truncated cone member was employed for properly feeding the gaseous mixture to the incandescent mantle.



Cole's Incandescent Burner.

This arrangement has, the patentee states, been very effective in use; but its cost has been heavy, on account of the cone member having to be made solid for the teeth on it to be sharp enough to pass the required amount of gaseous mixture. It was proposed to form this member in a cheaper way by pressing and fluting a cone; but "the flutes cannot be produced sufficiently clear and sharp, and a space has to be left between the edges of the flutes on the cone and the burner casing." The present invention therefore aims at the formation of this cone member in such a way that it can be readily pressed, and thus cheaply produced; while its design enables the teeth formation at the top, where they are necessary, to be clearly and sharply formed. M is the feeding member, which is pressed cup-shape with an outwardly projecting flange at the top and with a central hole at the bottom. The flange is horizontal, and in it teeth are formed. Owing to the shape of this horizontal flange for the reception of the teeth, it can be formed clear and sharp, although the member M is pressed. Instead of employing a gradually-tapering stout supporting and guiding stud or core for this member, a shouldered rod receives it on a threaded shoulder at its upper end; while it receives a wheel-like friction supporting frame at its lower end secured by a nut. The gauze cone G, mentioned in the Mallol specifications, can be arranged on the rod as shown. The parts in the mixing-chamber casing are slipped in and supported by the wheel frame, the teeth of the member M just fitting the casing shown.

APPLICATIONS FOR LETTERS PATENT.

26,032.—VASS, D., "Gas purification." Nov. 27.
26,046.—BALL, H. J., "Inverted burner." Nov. 25.
26,056.—BAUKE, F., "Desulphurizing of gases." Nov. 25.
26,057.—KOPPERS, H., "Gas-retorts." Nov. 25.
26,058.—DONNELLY, S. H., "Drilling, tapping, and inserting ferrules, or other connections for service-pipes in gas and water mains under pressure." Nov. 25.
26,132.—RENNES, D. W. VAN, and NAAMLOOZE VENNOOTSCHAP MASCHINENFABRIEK "DRAKENBURGH," VORHEEN O. W. VAN RENNES, "Two-cycle internal combustion engines." Nov. 26.
26,146.—JONES, A. E., "Washing acetylene." Nov. 26.
26,205.—FYFFE, A. M., "Valve." Nov. 27.
26,224.—FENNELL, W., "Producing and utilizing ignited gases under pressure in engines, pumps, and the like." Nov. 27.
26,225.—FENNELL, W., "Compressing gases in internal combustion engines." Nov. 27.
26,226.—FENNELL, W., "Joints for pipes carrying fluids under pressure." Nov. 27.
26,242.—SMITH, C., "Controlling gas supply to the bye-passes of incandescent burners." Nov. 27.
26,286.—HELPS, G., "Inverted lamps and burners." Nov. 28.
26,346.—ALLEN, T. G., "Acetylene generators." Nov. 28.
26,364.—WOODALL, H. W., and DUCKHAM, A. M'D., "Gas-tight devices for removing the residue from gas-retorts." Nov. 28.
26,373.—MITCHELL, F. H., LOMAX, J., and MILLWARD, A., "Vertical mantles." Nov. 29.
26,398.—HAACK, O., "Acetylene generators." Nov. 29.
26,426.—COWPER-COLES, S. O., "Generation of power." Nov. 29.
26,461.—SMITH, S., "Carburetting gas-making machines." Nov. 30.
26,482.—PYBUS, J., and WYNN, J., "Gas-stoves." Nov. 30.
26,486.—SERNÉ, L., "Gas cooking-stoves." Nov. 30.
26,492.—NEWSHAM, F. M., "Scouring gas." Nov. 30.
26,500.—HAMILTON, J. B., "Gas-heated irons." Nov. 30.
26,501.—WELLINGTON, S. N., and GIBBONS, W. P., "Gas heating and illuminating apparatus." Nov. 30.
26,504.—MANNESMANN, O., "Illuminating bodies." Nov. 30.
26,514.—LAWSON, A. J., "Double-acting internal combustion engines." Nov. 30.
26,529.—KENNEDY, D., "Pumps or meters." Nov. 30.
26,537.—MOND, E. S., "Recovery of ammonia in gas-producer or like plants." Nov. 30.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Friday, Dec. 6.

(*Before Mr. Justice* BRAY.)

Lucas v. Chesterfield Water and Gas Board.

This was an award of a Mr. Wainwright, stated in the form of a special case raising questions for the opinion of the Court, and submitting a point as to the special adaptability of land belonging to Mr. Bernard Lucas for the construction of a reservoir.

Mr. SUTTON appeared for the claimant; Mr. BALFOUR BROWNE, K.C., and Mr. W. M. ACKWORTH represented the Water Board.

Mr. BALFOUR BROWNE said Mr. Lucas only owned a portion of land taken by the Board, and upon this he could not build a reservoir without combining other land. The predecessors of the Board were empowered by various Acts of Parliament to take the water of the Linacre Brook, in the parish of Brampton, in Derbyshire, and certain reservoirs were constructed. In 1904, the Board wanted to build another reservoir, and they obtained an Act authorizing them to take the land in question from Mr. Lucas, and also some land from the Duke of Devonshire. The matter was referred to Mr. Wainwright to determine the price and the amount of compensation to be paid to Mr. Lucas. The special case stated that by the Act of 1904 the Board were authorized to construct the middle Linacre reservoir, and divert into it any water they were authorized to take. Having heard the evidence, examined the documents, and viewed the land in question, the Umpire came to this conclusion: (1) "That the site in question has peculiar natural advantages for a reservoir site in conjunction with the land on the opposite side of the valley belonging to the Duke of Devonshire, both on account of the general natural configuration of the land and the underlying strata." Stopping there, he admitted that it would be quite competent for the Duke of Devonshire and Mr. Lucas to agree to make a reservoir on their combined land, if there were other circumstances to justify the making of it; but in this case it would not be a construction against the Board, but of these two owners with the Board against the Board itself, which was absurd. They could do nothing without the consent of the Board, because the Board had all the water. Further than this, he objected altogether to the catch words

"special adaptability," which had come to be used in all these cases. There was no such principle known in the law; and anything that gave a value to land must be considered. He said this finding (the first conclusion) was too vague. According to the Umpire's other findings, the land had no advantage at all, because there would not be a drop of water to go into any reservoir. Later on, the Umpire said: "I find and determine that he is not entitled to any compensation from the Board in respect of any claim for water." How it could be a fit site for a reservoir under these circumstances, he (Counsel) could not conceive. The next finding (2) he submitted put the claimant out of Court. It was to the effect that the construction of a reservoir by Mr. Lucas and the Duke would be interfered with by a line of pipes laid down by the Water Board's predecessors under an Act of 1875, and such reservoir could not be constructed without the consent of the Board, unless their works were acquired by the Rural District Council under clause 40 of an Act of 1895; and such District Council were to combine with Mr. Lucas and the Duke in the construction of a reservoir, or were to allow them to do it. This was a mistake of law. The Umpire wrongly assumed that the conduit between the upper and lower Linacre reservoirs could be bought by the District Council; and it was absurd to suppose that the Board would give their consent to the construction of a competing reservoir. The Umpire said: "Upon the above findings, I am of opinion that the special natural advantage of the site as a site for a reservoir is a fit and proper matter for consideration as an element in assessing the value of the land to be taken, but that I ought not to make any award as compensation for water." How a site was suitable for a reservoir when there was no water, he (Counsel) could not understand. The question for the opinion of the Court was whether the peculiar adaptability of the land in question for the construction of a reservoir was or was not fit subject-matter for consideration as an element in the value thereof in assessing compensation, having regard to the facts above stated. The Umpire awarded the claimant £1615, and said that if the Court was of opinion that the natural and peculiar adaptability of the land for a reservoir was not fit and proper matter for consideration in assessing compensation, the award was to be reduced by the sum of £779.

Mr. SUTTON, for the claimant, contended that, having regard to all the circumstances which were disclosed before the Umpire, and which he was entitled to take into consideration, the award was right.

His LORDSHIP reserved judgment.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, Dec. 5.

(*Before Mr. Justice* BRAY.)

In the Matter of an Arbitration between the Wolstanton United Urban District Council and the Corporation of Burslem.

This was a special case arising out of the arbitration proceedings between the Wolstanton Urban District Council and the Burslem Corporation. A report of the arbitration appeared in the "JOURNAL" for July 30 last, p. 339. The award of the Umpire (Mr. A. J. Ram, K.C.), which was given in the "JOURNAL" for Aug. 13, p. 454, was subject, in regard to two items, to the decision of the Court as to whether the Corporation of Burslem were entitled to recover anything in respect of severance or loss of revenue.

Mr. E. HONORATUS LLOYD, K.C., and Mr. C. C. HUTCHINSON (instructed by Messrs. Batten, Proffitt, and Scott) appeared for the Wolstanton Urban District Council; and Mr. J. D. FITZGERALD, K.C., and Mr. R. S. CLEASE (instructed by Messrs. Sharpe, Parker, and Co.) represented the Corporation of Burslem.

Mr. FITZGERALD said he represented the claimants, the Corporation of Burslem, in a special case stated by Mr. Ram, as Umpire in an arbitration between the Corporation and the Wolstanton United Urban District Council. The arbitration arose under the provisions of the Wolstanton District Council's Gas Act of 1906. Prior to this Act, the Corporation were the owners of the gas-works in Burslem, and supplied gas within a portion of the Wolstanton Council's district. Under the Act of 1906, the Council obtained powers to purchase the mains, pipes, &c., of the Burslem Corporation within their district—the price to be paid for the same to be fixed by arbitration in accordance with the provisions of the Lands Clauses Acts in reference to the acquisition of land otherwise than by agreement. The Umpire had found that the value of the mains, pipes, &c., *in situ* was £9357. He had also found that the Corporation had sustained damage by severance to the extent of £895, and further damage by loss of revenue to the extent of £11,124. The right of the Corporation to the first amount—viz., £9357—was not disputed; but he understood that his learned friends disputed the right of the Corporation to recover on the other sums. The case showed that, by the Burslem Local Board Gas Act, 1877, the Burslem Corporation were empowered to supply gas within part of the township of Wolstanton. About 1904, the Wolstanton urban district was formed out of a rural district which included the township of Wolstanton, where, under an Act of 1877, the Burslem Corporation were supplying gas. In 1906, the Wolstanton Council obtained an Act which enabled them to purchase from the Burslem Corporation all the mains, pipes, &c., of the Corporation within the district of the Wolstanton Urban Council, in accordance with, and subject to, the provisions of the fourth section of the Burslem Local Board Act of 1877; and on the completion of the purchase all rights, powers, and obligations of the Corporation to supply gas within the said district were to cease. This was a new provision which was not in the Act of 1877. The sale and purchase was to be in terms to be agreed on, or, failing agreement, there was to be an arbitration, in accordance with the terms of the Lands Clauses Act with reference to the taking of lands otherwise than by agreement. The material part of the enactment was that the arbitration was to be under the provisions of the Lands Clauses Act relating to the compulsory acquisition of land. In the Act of 1877, all the Lands Clauses Acts were named, and no distinction was made. But here there was a distinction; and, in the provisions of the particular Act mentioned, compensation for damage by severance was expressly included. This was a compulsory acquisition of the mains, pipes, and other works of the Corporation of Burslem in Wolstanton; and by the Act of 1906 the Burslem Corporation were prohibited from supplying gas in future within that district, while the Wolstanton Council obtained the right to supply. The price to be paid for compensation was to be fixed by arbitration under the Lands Clauses Acts; and the provisions relating to the compulsory purchase under these Acts was made applicable. The Corporation and the Council did not agree on the amount to be paid; and an Umpire was appointed—Mr. A. J. Ram, K.C. He sat on July 22 last; and subsequently Mr. Ram stated his award in the shape of a special case. The Umpire said that it had been proved before him that a certain main pipe had been laid by the Corporation, and that after the sale of the outside district to the Council this pipe would be for some years to a large extent useless and unfruitful to the Corporation. It was also proved that there were certain works which would be in a similar position to a large extent for several years. The Umpire also held it proved that the Corporation would suffer loss of revenue at present obtained by them from their customers in the Council's district by reason of the fact that their rights to supply gas in the district would cease on completion of the purchase. The learned Counsel then read the Acts which applied to the case, and contended that, in the circumstances, section 63 of the Lands Clauses Act applied, and that compensation was payable both for severance and for loss of revenue.

Mr. HONORATUS LLOYD, for the Council, submitted that, under section 9 of the Act of 1906, it was the Umpire's duty to determine only the price or consideration to be paid in respect of the mains, pipes, and fittings of the Burslem Corporation within the Wolstanton district, and nothing more. In paragraph 4, the Umpire had dealt with this point separately, and had awarded £9357.

His LORDSHIP said he did not think that by making this award separately the Umpire meant that this was the total price.

Mr. HONORATUS LLOYD said he would not take any technical point. What he urged was that in that paragraph the Umpire dealt with all he was entitled to deal with. It was suggested that there was some sort of hardship in construing the Act as the Wolstanton Council suggested, because the Corporation, having bought the whole undertaking, were now called on to part with a portion of it on a less remunerative basis. But the Corporation had bought subject to the terms of their own Act, drafted by themselves; and section 4 of the Act of 1877 only gave them the right to supply gas within the limits of that Act, subject to the proviso that nothing in the section should prejudice any right of the Wolstanton district to apply for powers to supply their own gas when they became a Council. Therefore the Act which gave the Corporation power to supply the Wolstanton district provided, in express terms, that such right should be without prejudice to Wolstanton applying, if it became an urban authority, for parliamentary powers to supply its own district, and to take over the gas undertaking on payment of compensation. Now the Act of 1906 said that the Corporation should sell, and the Council should purchase, all the mains, pipes, &c., within the Wolstanton district. There was no transfer of all the rights and powers of the Corporation in transferring the pipes, &c. The powers of the Burslem Corporation in this respect were dead. If the arbitration was to be conducted under the Lands Clauses Acts, he submitted that this meant in accordance with the provisions of the Acts referring to arbitration.

His LORDSHIP said that that might make a difference. If it merely brought in the arbitration clauses, it might be that it would not bring Mr. Fitzgerald's case within section 63 at all.

Mr. HONORATUS LLOYD said that, even assuming he was wrong on the first point, and assuming the whole group of arbitration sections were brought in, he submitted it could not avail his learned friend, because they could not be applied to the facts. If section 63 was brought in, then it became all important in the interpretation of the word "lands." In sub-section 2 of section 9 of the Act of 1906, it was provided that "in the construction of the provisions of the Lands Clauses Acts the expression 'the promoters of the undertaking' shall mean the Council, and the expression 'lands' shall mean the mains, pipes, and other works of the Burslem Corporation." Before section 63 could apply, it was essential that there should be land left to the vendors which was injuriously affected by the compulsory taking. But here the whole of the works (or lands) were purchased, and there was nothing left which could be injuriously affected. Section 63 only applied where some land was taken and some left, which was injuriously affected by the taking. He therefore submitted that the award should be confined to the sum of £9357, and that nothing should be allowed for severance or loss of revenue.

Mr. FITZGERALD, in reply, said that items of severance or loss of revenue were items of a damage which the Corporation had suffered, and for which the Council of Wolstanton had got the equivalent.

His LORDSHIP said the case had given him a good deal of difficulty, and he was by no means clear as to the result. But having heard the arguments of Counsel on either side, he did not think any advantage would be gained by his taking time to consider the case, especially as it would probably go to a Higher Court. The question was whether the claims made by the Burslem Corporation against the Wolstanton Council ought to be allowed. There were different claims which must be dealt with separately. As to section 4 of the Act of 1877, it was important to consider the circumstances under which the section was passed, because this was not an ordinary case, under the Lands Clauses Acts, of Parliament stepping in and providing for compulsory purchase. The Corporation got their rights subject to the proviso that a future sanitary authority for the township of Wolstanton might apply for parliamentary powers to supply their district with gas; and therefore they never had entire control or the permanent right of supplying gas in Wolstanton. They had it subject to the defeasance of what might happen in the event of the sanitary authority of Wolstanton desiring to supply themselves with gas. The next point he noticed was that the word "compensation" was not used at all in the fourth section—only the word "price" was used—and the only way in which they could get in the word compensation was from the Lands

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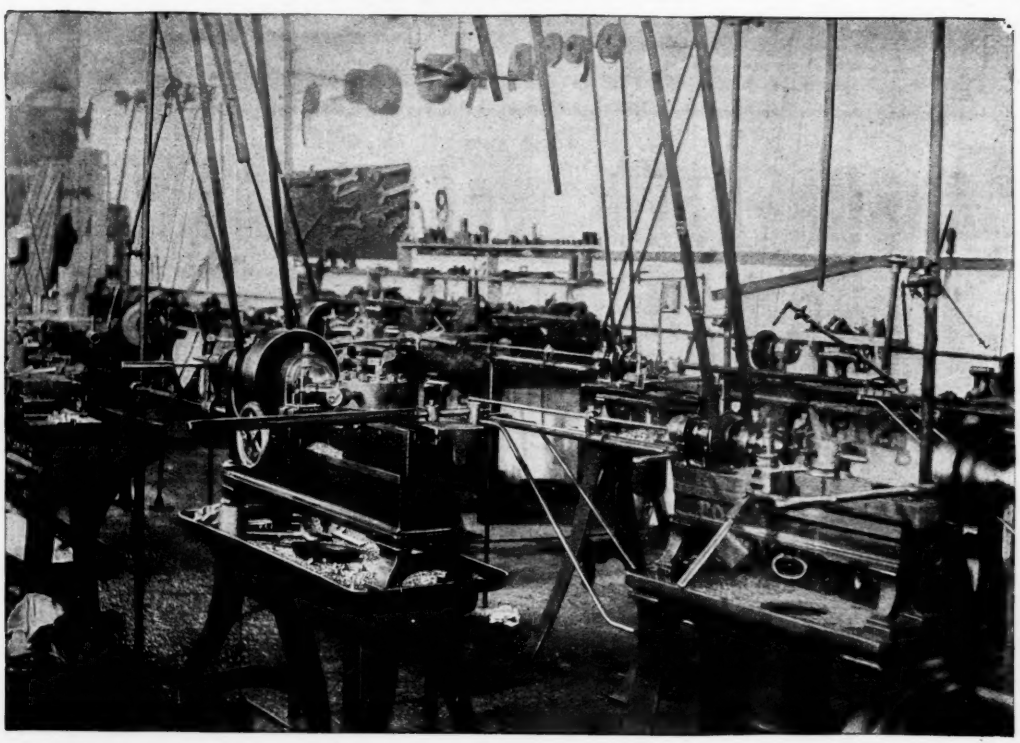

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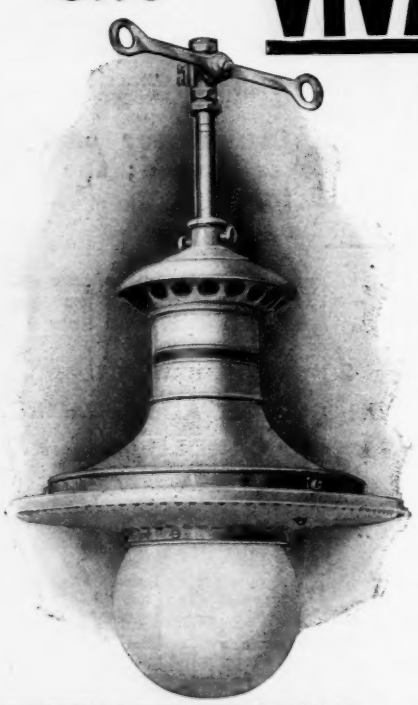

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Clauses Acts. As the matter was left in section 4 of the Act of 1877, he thought there was a little ambiguity; and it seemed the Legislature recognized this ambiguity when they came to deal with the Act of 1906, though they did not intend to give larger or smaller rights than the parties had before. The first sub-section of section 9 of the Act of 1906 enacted that the Council should purchase all the works of the Burslem Corporation, and then, in the second sub-section, this was amplified. The words "price" or "consideration" were used, and the sub-section went on to provide that the sale and purchase should be for such price or consideration as should be determined by arbitration in accordance with the provisions of the Lands Clauses Acts with reference to the taking of lands otherwise than by agreement. It was on these words that the dispute had arisen; and the question was whether they meant that such provisions, so far as they related only to arbitration, were to apply, or whether they were to apply altogether so far as they were capable of application. This was a very difficult question to determine; and he should be inclined to adopt the wider interpretation, and say that the sub-section was not confined to these provisions which related to procedure, but related to the provisions which were applicable. But the sub-section went on to say how the provisions of the Lands Clauses Acts were to be applied. It said: "The expression 'lands' shall mean the mains, pipes, and other works of the Burslem Corporation." The corresponding definition in the Lands Clauses Acts was quite general. Here they had deliberately given the expression "lands" a specific meaning—mains, pipes, and works; and he could not consider this as a mistake. He must take it that they meant what they said, and that when he proceeded to examine section 63 (the one relied on by Mr. Fitzgerald), he must use that definition. He certainly considered it was fairly arguable that the section was never intended to be applicable at all. There was no mention in section 9 of the Act of 1906 of compensation or damage; and therefore he should be slow to think that section 63 was ever intended to apply, as when he tried to apply it to the present facts he found it had no application at all. It was obvious, when framing the Act of 1906, that there might be a claim for severance; and he thought he ought to pay attention to the fact that there was no word at all in the Act about compensation for severance. Taking all these matters into consideration, it seemed to him that section 63 had no application to the arbitration. This was the only section which gave compensation for severance; and therefore the claim for compensation for severance failed. The other claim was for compensation for loss of revenue; and Mr. Fitzgerald had pointed out that if it was once found that it was intended to give compensation for severance, it was not a long step to find that it was intended to give the Burslem Corporation compensation for the damage they sustained by being deprived of their works. But in section 9 of the Act of 1906 it was provided in terms that "all rights, powers, and obligations of the Corporation shall cease and determine;" and not a word was said about compensation to be paid for that cessation. Therefore he could not think it was intended that any such compensation should be given. It was again obvious that such a question would arise; and yet not a word was said about compensation to be given for such cessation. Therefore he could find no words in the section which would entitle the Umpire to include a sum for compensation to the Corporation for loss of revenue or loss of goodwill. They had a right to supply only for a limited time; and after that, when certain things were fulfilled, this right was to cease. He must therefore answer the question put in the special case by saying that neither of the sums mentioned as compensation for severance or loss of revenue ought to be allowed.

Mr. FITZGERALD said he made no application as to costs, because he understood that all the costs of matters arising out of the arbitration proceedings had to be borne by the Wolstanton Council.

Mr. HONORATUS LLOYD submitted that the Corporation should pay the costs of these proceedings.

His LORDSHIP said that was not an unreasonable application; but as he felt no great confidence that his judgment was correct, he did not think he ought to make any order as to costs.

Mr. HONORATUS LLOYD considered that, after this direct invitation to the other side to appeal, they ought at least to pay the costs of this hearing.

His LORDSHIP said be would make no order as to costs.

COUNTY OF LONDON QUARTER SESSIONS.

SESSIONS HOUSE, CLERKENWELL.—Monday, Nov. 25.

(*Before Mr.* R. LOVELAND LOVELAND, K.C., *Chairman, and a Bench of Justices.*)

Metropolitan Water Board and their Assessments.

The report of the proceedings in the Metropolitan Water Board's appeals against the assessments made by certain Unions and Boroughs at the quinquennial valuation of 1905, was carried last week (*ante*, p. 721) to the point in the City of London Union case at which the Court decided several matters of principle, subject to anything that might transpire in the other cases. These points were that the undertaking should be treated as a whole; that the calculations should be based on the accounts, and not on capital value; and that the distribution should be taken on the recognized principles laid down by the Courts—on the ratio of gross receipts in each Union or parish, so as not to amount to less than £31,277 in the City of London Union.

Mr. DANCKWERTS, K.C., Mr. HORACE AVORY, K.C., and Mr. BOYDELL HOUGHTON (instructed by Mr. Walter Moon) appeared for the Water Board. The Counsel for the City of London Union were Mr. BALFOUR BROWNE, K.C., Sir EDWARD BOYLE, Bart., K.C., M.P., and Mr. WALTER C. RYDE (instructed by Messrs. James White and Leonard). Mr. BALFOUR BROWNE and Mr. WALTER RYDE appeared on behalf of the Greenwich Union; Mr. WALTER RYDE, Mr. COX SINCLAIR, and Mr. BICKMORE, for Woolwich Union; Mr. CUNNINGHAM GLEN and Mr. A. BETHUNE, for the Holborn Union; Mr. MORTEN and Mr. SAUNDERS, for the Borough of Islington; and Mr. A. C. RUSSELL, K.C., and Mr. COURTHOPE MUNROE, for the Borough of St. Pancras.

City of London Union.

Mr. DANCKWERTS, addressing the Court on the question of costs (which was left open at the previous sitting on the decisions as to principle being given), said the figures in the other cases ought not in the smallest degree to influence the matter. This would be putting in extraneous matters for the purpose of judicially determining the points in the City case.

The CHAIRMAN remarked that they had the rateable valuation of the unproductive portion of the undertaking, and of the whole concern. What the Court wanted now were the gross receipts in each parish over the complete area of the Board, in order that they might be distributed. He asked that one of the valuers should work this out. Meanwhile, the City case would be in abeyance; and the other appeals would be proceeded with—namely, Greenwich, Woolwich, Islington, St. Pancras, and Holborn.

It was agreed that the evidence already given on behalf of the Water Board should be taken as applying to all the cases.

Greenwich Union.

Mr. BALFOUR BROWNE, in opening the case for the Greenwich Union, said there were three parishes concerned. Mr. Danckwerts might be right or wrong in saying that the method by which the rateable value should be arrived at was by taking the whole undertaking; but what they had to get at in the end was the rateable value of these three parishes. It did seem an extraordinary thing that, though the receipts in Greenwich were going up, yet, according to the argument of his learned friend, and the figures of Mr. Ryde, the rateable value was going down, or ought to go down, and this only upon one circumstance—the circumstance that now Greenwich was in the same landlord's hands as all the rest of the water undertaking in London. There was no distinction other than this between the position of the hereditament in Greenwich at the last quinquennial and to-day. He could show that the receipts were greater, and that in every way the district had increased. It might be true that in certain districts it was impossible to arrive at the rateable value of the district part; but, in the case of Kent and of Greenwich, this was not so. They had heard from the witnesses called by the Board that there were five districts now existing in London. One of these was Kent; and the Board, in their report to March, 1906, stated that there was no water derived from river sources, but the whole of it from wells. This of itself would lead, he thought, to an inquiry as to whether river sources were not a far more expensive method of getting water than the wells. They knew the Board paid very large sums to the Conservancy, in order to keep the waters of the Rivers Thames and Lea pure; but, further than this, on certain occasions when there were floods or the stream was very low, water was not taken from the rivers, but from storage reservoirs. This involved the construction of very expensive reservoirs; and when they found, for instance, that the whole of the supply of the western district was river water, while all that for the Kent district came from underground, it was obvious at first sight that one must be much more expensive to supply than the other.

The CHAIRMAN remarked that the five separate districts were merely for administrative and engineering purposes; and if the Board chose so to divide them, that was no reason why the Court should take the concern as five separate enterprises.

Mr. BALFOUR BROWNE replied that in this case perhaps the Court had to take 200 separate enterprises, because every parochial part was held to be a separate enterprise of the whole in connection with the whole, so that they had to do a great deal more than divide it into five. But, in the meantime, what he had to show was that Kent was treated by the Board entirely as a separate entity, and that it derived its water from entirely separate sources to the other districts. In the appendices to the report were the statements: "Total quantity of water supplied during the year—Kent district, 6,879,678,065 gallons," and "Total volume of water during that year from the wells in Kent, 6,879,678,065 gallons." This showed that every drop of water that was supplied from the wells in Kent was furnished to the Kent district; so that, so far as the water supply was concerned, it was an absolutely independent district—not relying in any way upon intercommunication pipes, which were made so much of in relation to the City. In one of the appendices occurred the statement: "No water is received from any other division to Kent; and no water is received by any other division from Kent. With the exception of the Kent and East London districts, all the other Companies participated in the intercommunication water." So that apparently Kent stood in a totally different position from any other district in London.

Mr. DANCKWERTS: The report you have read refers only to a particular year.

Mr. BALFOUR BROWNE said that neither in that year nor the next did a drop of water come through the intercommunication main.

The CHAIRMAN remarked that it was like having another reservoir in case it was wanted.

Mr. BALFOUR BROWNE agreed; but he said it was quite possible to have such assistance from another Company—as had happened in the past, when for payment the East London Company took water from the New River and Southwark and Vauxhall Companies. Now, though he was arguing very strongly in favour of treating the Kent district as a separate entity, he was not going to blink the fact that the Court had decided that for some purposes they must, in arriving at the rateable value of the parts, ascertain the rateable value of the whole. This was a decision; and though it was not given in his case, and he thought he would be perfectly justified in asking the Court to decide differently on his facts, still he was not going to do it. He was going to deal with the undertaking somehow as a whole; but he would point out the injustice of the other side's method of doing it. They took the gross receipts of the whole undertaking; and from them they deducted the working expenses. But most of the working expenses of the whole had not been incurred for

his district at all. Then there came another injustice in their method of dealing with the accounts—they next deducted the indirectly productive parts. Suppose there were no unproductive parts in his Union, the result would be that it would be denuded of its rateable value by reason of works elsewhere—by deducting the whole of the unproductive parts, they were taking off from Kent the Staines reservoirs. This seemed to him grossly unfair. By taking off the unproductive works before arriving at the rateable value, they reduced the rateable value of the parishes in the Greenwich Union from 44 per cent. to 21 per cent. of the gross receipts—or about one-half. This could not be right; but, taking the Court's decision, what would be the result of arriving at the rateable value of the whole undertaking without considering productive or unproductive works? He had a table, in which, for the purposes of his calculation, he had taken the gross receipts from Mr. Ryde—£2,761,010. The working expenses without rates, including part statutables, he took out, £876,246; and this left the receipts, *plus* rates, at £1,884,764. As to the tenant's share, he said the capital required was £750,000; and instead of jumping at 8 per cent. of the gross receipts, as Mr. Ryde did, he took the amount that had usually been allowed by the Court—though in recent cases he did not think that probably it had been considered the right figure—namely, 17½ per cent. of the tenant's capital. This gave £131,250 as the reduction for the tenant's share; and he suggested that it was perfectly reasonable to suppose that any tenant for this sum (having paid all his expenses) would be willing to take and run this enterprise. Deducting, then, the tenant's share, there was an amount left of £1,753,514. The appellants had claimed in this case a renewal fund, which he was not at all certain was necessary. He thought that the maintenance, repairs, and renewals already charged in the working expenses were sufficient to maintain the whole of the tenant's capital in an absolutely efficient condition. But in his table there was a renewal fund of £39,891, which left the rateable value, *plus* rates, £1,713,623. The rates, at 6s. 9d. in the pound on the rateable value, came out at £432,410; so that the rateable value of the entire undertaking was £1,281,213. This was the whole undertaking, both productive and unproductive, in the hands of the Water Board. The rateable value, *plus* rates, of the entire undertaking he said was £1,713,623; and as the total water-rental, according to Mr. Ryde, was £2,651,209, this was 64·63 per cent. of the water-rent. Having thus got the rateable value of the whole of the percentage, the portion for the Kent district had to be distributed. The total water-rental for this district for the year ending June 24, 1904, was £221,282; and the rateable value, *plus* rates, upon the percentage just given, brought out £143,014. The rateable value of the indirectly productive portions of the undertaking in the district of Greenwich with which he was dealing was, according to a valuation he would put before the Court, £33,490; and the rates, at 6s. 9d. in the pound, came to £11,302. If these two figures were deducted from the £143,014, they arrived at a rateable value, *plus* rates, of the service-mains in the Greenwich district of £98,222, or 44·4 per cent. of the water-rental, which was £221,282. This was the percentage that he sought to apply instead of the 21 per cent., which was the figure in the case of the Water Board. The total for Greenwich came to £30,885, as against the £25,229 appealed against. This was taking in each of the three parishes 44·4 per cent. of the receipts as the rateable value, *plus* rates, of the mains and services, and 5 per cent. of the value of the indirectly productive works—carrying mains, &c. He would ask the Court to come to the conclusion that this was in conformity with their decision that the undertaking was to be valued as a whole. In the Kent district 51 per cent. of the capital had been expended on unproductive works, and 49 per cent. on productive mains; whereas in the case of six other absorbed Companies 70½ per cent. was expended on unproductive works, and 29½ per cent. only on mains. If these were thrown together, of course, the result was that Greenwich was saddled with unproductive works that it had nothing whatever to do with.

The CHAIRMAN: That calculation has not been adopted by any of the High Courts, has it?

Mr. BALFOUR BROWNE: The point has never been raised in the High Courts at all. It is an entirely new method.

The CHAIRMAN: The Water Board would not have adopted it if it had not been adopted by the High Courts in other cases.

Mr. BALFOUR BROWNE said he ventured to think this was not so. In this particular case, up to the present time, of course, each Company had been treated separately. Suppose he had in his parish half productive and half unproductive works, if the latter were taken away at one place and then put back again at another, it did not make any difference; but if, on the other hand, they deducted from his parish the unproductive works at Staines, and then did not put back anything (because this would be put back in Staines), there was an injustice. The respondents were adopting the method that the Court had suggested—taking the undertaking as a whole, and distributing this whole among the various parts of London. The appellants by their plan did not arrive at the value of the whole, but merely at the value of the productive parts; and this they distributed. Then when they came to put back the unproductive parts, there was nothing for Greenwich. The rateable value appealed against was £25,229. He had already argued as to whether the rating should be done on gross or net receipts; and this would have to be determined.

Mr. *Donald Dinwiddy*, examined by Mr. RYDE, said his firm had acted both for Greenwich and Woolwich for a period covering five or six quinquennial valuations. The valuation Mr. Balfour Browne had quoted was made by him. He had arrived at the £750,000 for tenant's capital in the following way: Four months' working expenses, £196,512; stocks and stores in hand, tenant's proportion, £52,077; meters, fittings, and service works, £227,133; office furniture, £69,059; and floating cash and allowance for three months' rates, £150,000. This came to £704,781; and he had called it £750,000. He took 17½ per cent. of this, which gave a tenant's share of £131,250; and this was an absolutely net return. The renewal fund, £39,891, he had taken from Mr. E. H. Stevenson. It was certainly a very ample figure. He never heard of a renewal fund for mains ever being claimed in either a gas or water case, where they were renewed out of revenue. The total of his valuation for the three parishes in the Greenwich Union was £30,885, compared with the £25,229 appealed against. Though the appellants contended that the assessment of to-day should be lower than the previous quinquennial, the assessments of houses had gone up, and the water-rates had increased very considerably. This applied to both the Greenwich and Woolwich Unions. As to Mr. F. C. Ryde's valuation, the 620 acres of land at Staines which figured at £236,754, would not in witness's opinion exceed in value £68,000. He had also looked at the actual assessments of 60 per cent. of the unproductive works belonging to the Board, and had in this way been able to find out the value of the Board's unproductive works. He examined 30 works out of the total of 129; but they happened to be the biggest ones. The 30 works were separately assessed at £252,938 rateable value; and the Board's estimates were £334,128. Therefore the estimate of the Board was in excess of the actual assessment by £81,190.

The CHAIRMAN: Do you find in your experience that assessments really show the actual value of the property?

Witness: Yes; it is as near as you can get it.

That the assessments show the real value of the property—in other words, that the property is always assessed up to its last shilling?—No; I cannot go so far as that. But it is very much better to take the actual assessments; and it is the practice in this Court in every case as a rule to take the actual assessments.

It is arrived at by compromise, and in all sorts of ways?—There is no possible way of checking these enormous works.

The CHAIRMAN: Yes, there is, by going and seeing what is the actual value.

Mr. DANCKWERTS: I remember the late Sir Peter Edlin ruling that he would not look at the actual assessments.

In further examination, witness submitted a table showing the reservoir capacity in the several districts. The whole of them, excluding Kent, he said, had storage capacity of 38 days; while Kent only had 4·5ths of a day—underground.

The CHAIRMAN: It only shows how necessary it is that you should be joined up to other reservoirs and other systems?

Witness: No; we do not want them. Our system is entirely different from any other.

Further examined, witness said that, taking the Board's valuation, the Kent district only got an assessment of 8 per cent. for its works—the works which were quite sufficient to supply the water to that district, which was entirely self-contained—and the remainder of Water London would get 22 per cent. of the gross receipts as assessment for works. In a district which only required works to the value of 8 per cent. of the gross receipts, directly productive mains should be of greater value than in the remainder of London, which required works to the value of 22 per cent. of gross receipts. The Kent district was actually run as a water-works with only 8 per cent. of its gross receipts attributable to indirectly productive works. He had prepared a table applying his methods to Mr. Ryde's figures; and the result was such as to justify the assessment. Mr. Ryde's valuation of the whole undertaking was 45·3 per cent. of the total water-rental. The last receipts of the Kent Water Company showed receipts of £221,282; and applying the 45·3 to this, he got as the rateable value of the whole of the Kent district £100,241. From this he deducted the indirectly productive works, as per Mr. Valon, £17,523; and the carrying mains, as per his own firm's valuation, £16,395. Deducting this left £66 323 as the rateable value of the service-mains.

Mr. DANCKWERTS, interposing, said he understood the law of rating to be that the indirectly productive works must be rated upon their annual rateable value in the parish in which they were situated. Then the directly productive mains were to enjoy a percentage of the gross receipts as their rateable value. Here they had got a calculation which was founded upon the fallacy that the rateable value of the directly productive and indirectly productive works in the parish must both bear (or might bear) some percentage to the gross receipts over the whole concern.

Mr. RYDE: We submit that this is the proper way to do it.

The CHAIRMAN: You can put it in for what it is worth; but I quite agree it is a waste of time.

Mr. RYDE replied that he would like to go through the figures very shortly.

Examination continued: The total value of the service-mains in the Kent district was £66,323, which represented 29·97 per cent. of the water-rental in that area, which gave a rateable value of £18,714 for the mains and services in the Greenwich Union. For the small fraction of the Southwark and Vauxhall district he took 20 per cent. of the receipts, which came to £417. Then taking the indirectly productive works and mains at £7927 (according to the appellants' case), there resulted a total rateable value in the Greenwich Union of £27,058, as compared with an actual total rateable value appealed against of £25,229. He had adopted the same method for the Woolwich Union, and arrived at a rateable value of £16,590, as compared with the £14,681 appealed against. As with Greenwich, practically the whole of the figures taken were those of the appellants. His table therefore purported to show that, if his method was right, on the appellants' own figures the appeal failed in both Unions.

In cross examination by Mr. HORACE AVORY, witness said he stood by his first valuation. In arriving at the value of any water-works undertaking in any particular Union, he had never gone on any other basis than by first ascertaining the rateable value of that particular undertaking. But this case was different. Supposing, as a matter of fact, that the Metropolitan Water Board was one undertaking, this valuation of his would be wrong. The whole difference between him and the appellants was that he said the Kent district was a complete undertaking—a distinct concern. His whole idea was to arrive at the value of the entire Kent district, which was a distinct entity according to the Water Board's report. If he could find the gross receipts and the working expenses of the Kent district, he would very much prefer making a valuation from the figures. But they were not available. This was why he started with the gross receipts of the whole undertaking as £2,761,000.

Mr. HORACE AVORY: Then you admit that it is not possible in this case to find the working expenses for the Kent district so as to deduct them from the gross receipts for the Kent district?

Witness: I do.

The CHAIRMAN: You cannot find out the working expenses in the Kent district, nor can they be found out?

Witness: They could not be found out accurately; but I certainly think they could be found out very approximately. It would be better from the Union's point of view to be able to do that—to make a separate valuation—because the expenses in the Kent district are very much less, and always have been less, than those of the remainder of the district. I should have done it if I could.

Cross-examination continued: In his valuation he had not deducted the unproductive works of the whole undertaking; he had distributed the Kent district on the parochial principle. His rateable value, *plus* rates, of the entire undertaking, which he brought out at £1,713,000, included all the unproductive works.

The CHAIRMAN: Do you not know it has been held in all the cases I have ever come across that, after having ascertained the rateable value of the whole undertaking, the first thing you have to do is to cut off the unproductive mains?

Witness: Certainly; and I agree upon that principle.

But you have not done it?—I have.

Mr. HORACE AVORY: You have not anywhere deducted the rateable value of the unproductive works of the whole?

Witness: No; but I have later on in the Kent district.

In further cross-examination, witness admitted that if he had deducted the unproductive works his 64·63 per cent. would have been much reduced; but then he would not have had to deduct the £44,792 for the rateable value of the indirectly productive portions in the Kent district. He had tried the other method, but had not got the result with him. This calculation, deducting the indirectly productive works and finding out the net rateable value of the whole concern, was made before Mr. Ryde gave his evidence.

The CHAIRMAN: Why did you not produce it here to-day as an alternative?

Witness: Because I do not think it is the right way of doing it. I think it is an erroneous way of looking at the figures.

You went into the whole of the figures. Why did you make it?—I did not go into the whole of the figures.

Because you found out subsequently that it pretty well agreed with Mr. Ryde's figures?—Naturally, such a valuation would pretty well agree with Mr. Ryde's figures.

Cross-examination resumed: Three-fourths of the land at Staines was agricultural land, and cost about £95 an acre; but he quite agreed some of it might be worth £382 an acre.

Re-examined by Mr. RYDE, witness said the calculation to which the Chairman had referred was really made as a check—"not much more than out of curiosity to see what it came to."

Mr. *E. H. Stevenson*, in answer to Mr. RYDE, said he had made a valuation based on the business of the whole undertaking of the Board. He had started with the gross receipts as shown by the accounts—£2,762,352. The working expenses, £589,540, he also took from the accounts—of course, leaving out those items which he thought were landlord's charges, and putting into the proper schedule those items which he regarded as statutables. This left the net receipts, *plus* rates, £2,172,812. The tenant's share he put at £50,000, because in his opinion a tenant brought practically no capital whatever into an undertaking of this sort, if he acted and collected his water-rates in the legal manner. According to law, they ought to be collected quarterly in advance, on the quarter days; and therefore any tenant coming into the undertaking could, and ought to, collect his water-rates before he had to expend any capital whatever. The total working capital which he considered that a tenant on the old and usually admitted principle would require was £616,000; but this included three months' rates, £96,000. He had practically put down £50,000 for cash at bank. The tenant ought to receive, before supplying any water, nearly £479,000—a quarter's water-rates, less one-fourth for the empties—and he did not require to pay the three months' rates at once, nor would he need the cash at the bank.

The CHAIRMAN: Do you not know that always, so far as I can recollect, the practice has been to allow at least a quarter's money in hand in all these cases?

Witness: It has been the practice in water cases. It is not the practice in railways; it is not the practice in tramways; and it is not the practice in gas.

And you have not done it in water?—I do not allow it in water, because water is a stronger case than either tramways or railways.

Further examined, witness said that in his judgment the position of a water company was not comparable with that of a gas company in regard to the way in which it got its revenue. There were water companies who secured their revenue quarterly in advance; and though this undertaking did not do that, it got one quarter in arrear and the next in advance. A gas company could never get its revenue in advance. All the money which was received during the quarter in respect of residuals and from prepayment meters was deducted. He thought his allowance of £50,000 would be enough to induce a tenant to take the concern. The statutables he put at £285,706. This was arrived at because in the working expenses he had struck out certain charges which he considered landlord's charges; and these he had brought into the landlord's statutables. These were the repair and maintenance of the reservoirs, repair and maintenance of the filter-beds, a proportion of the repair and maintenance and renewals of the engines, pumps, and premises, and 75 per cent. of the repair of main-pipes. He did not allow anything for a sinking fund in a concern this size, because renewals were always going on, and were charged year in and year out, according as they were made. The engines were of varying ages; and if one was to be thrown out of use and a new one put in, it would all be charged against the revenue account. Deducting the £286,706 for statutables, this left a rateable value, *plus* rates, of the Board's undertaking as a whole of £1,836,106. Taking from this the average rates, £463,318, there remained a rateable value for the entire undertaking of £1,372,788, or 69·33 per cent. of the water-rental of the whole undertaking. He allocated this to the Kent district in the same manner as Mr. Dinwiddy had done; the only difference being in the proportion. This gave a rateable value, *plus* rates, of the service-mains in the Kent district of £108,623, which represented 49·09 per cent. of the gross receipts in Kent.

The CHAIRMAN: In considering for how long a period the working expenses were to be provided, it must be assumed that the hypothetical tenant on going into possession would not be entitled to receive the outstanding debts owing to his predecessor; and therefore he would require capital in hand?

Witness: He would require capital in hand, unless he got in the water-rates previously, which, according to the law, he ought to do. It says that the rate shall be paid.

But we know, as a matter of fact, it is not?—In several cases I know it is paid quarterly in advance.

In the case of this undertaking, it is paid half yearly?—It is paid half yearly for a quarter in arrear and a quarter in advance.

Therefore there would not be at all times sufficient capital to carry on as a hypothetical tenant?—No; not as they do it here. I quite admit that.

You have not made any allowance for that?—Not for how they do carry it on, but for how, according to the law, they really ought to carry it on.

The CHAIRMAN: But here we are dealing with a specific case.

Cross-examined by Mr. DANCKWERTS, witness said he did not agree that if no renewals were charged in the Water Board's accounts for at all events some of the things that might in the future require renewal, it was proper to have a renewal fund. The renewals were going on continually throughout the year, and from year to year. His £50,000 for the tenant's share was not based on any calculation. A tenant must have some honorarium which would help him, or induce him, to take the concern. Certainly, it was under 2 per cent.; and he had not known any water company where so small a tenant's share as 2 per cent. on the gross receipts had been taken in rating. This was because he really did not think that anybody had viewed the matter from the same point that he did—namely, that the money ought to be received before the consumer was supplied with water. He was not aware that in "Lass's Analysis" the cost per 1,000,000 gallons of water for maintenance of reservoirs, maintenance of mains, pumping, and filtration, was given as £5·43 for Kent, £4·1 for Chelsea, and £4·69 for East London. He admitted this would show that the fact that there was no filtration in Kent was more than counterbalanced by other considerations. Everybody had treated the Kent district as an entity by itself until this case came on. He did not think that in connection with any of the wells concerned in the Kent district the entrance of sea water was a practical danger. If, however, it did get in the intercommunication arrangement would prove a good thing. But at present Kent was, from an engineering point of view, absolutely an independent portion of the Board's system.

Re-examined by Mr. RYDE: "Lass's Analysis" for 1902, he agreed, showed that Kent made a net profit, in round figures, of ½d. per 1000 gallons more than the average of the other Companies, which would be something over £2 profit per 1,000,000 gallons more than the others. As to a renewal fund not being necessary, companies as a rule when an engine broke down repaired or renewed it, if necessary, out of revenue. He had treated the matter exactly as he had done in the case of the South Metropolitan Gas Company, when he was on the side of the Company. They did not ask for a renewal fund, but took it that sufficient money was spent on renewals. The Water Board was a much bigger concern; and therefore renewals would be spread over a larger area, and must be more continually being made. Taking a comprehensive view of the whole, adequate provision was being made out of working expenses for both repairs and renewals.

WESTMINSTER COUNTY COURT.—Tuesday, Dec. 3.

(*Before His Honour Judge* WOODFALL)

Metropolitan Water Board v. Cotton Seed Company, Limited.—The Question of Jurisdiction.

This was an application by the Metropolitan Water Board that their case against the Cotton Seed Company, Limited, of Cubitt Town, might be reinstated for trial. It will be remembered that the action was to recover the sum of £49 12s. 6d. for water supplied through defendants' meter in extinguishing a fire; and when it came on, defendants urged that the Court had no jurisdiction to try it. This objection was upheld (*ante*., pp. 577, 724), and resulted in the present application.

Mr. A. B. SHAW appeared for the Water Board, and Mr. GEORGE KEBBELL for the defendants.

Mr. KEBBELL said he was entitled to seven clear days' notice of the application, which he had not had; and another thing was that the grounds of the application were not sufficiently or properly set forth. It was stated that there was a statutory obligation upon the defendants to pay their rate at the head office. He had asked the Board's Solicitor to refer him to this statutory obligation; and the reply was that the point was governed by the Water-Works Clauses Act, 1847, and the Metropolis Water Act, 1902, by which the Board was constituted. He wished, however, to be referred to the section.

His HONOUR said he could not see what this had to do with the motion. The Acts of Parliament were as open to the inspection of Mr. Kebbell as to that of any other person. If, however, they relied upon one particular section, the Board ought to indicate it, and if they relied on the Act at large they might say so.

Mr. KEBBELL remarked that they refused to do so; and under the circumstances he asked for seven clear days' notice, and that the defendants should be directed to name the section. At present he was quite in the dark as to the section that was being relied upon.

His HONOUR said he thought there must be a new trial, for reasons that he had stated when the matter was last before him. He was quite satisfied the case ought to be gone into again. He did not wish to prevent Mr. Kebbell arguing the case; but it was useless for him to do so at this stage.

Mr. KEBBELL said his objection was that in this case the Board were relying upon an agreement. This agreement contained certain

provisions which were *ultra vires* of the Acts of Parliament. For instance, one provision was——

His HONOUR: This is sheer waste of time.

Mr. KEBBELL: You are making it very difficult for me.

His HONOUR: I wish to make it impossible. The point has not been argued; and the case must be set down for rehearing in order that it may be argued.

Mr. KEBBELL remarked that he was forced to say his Honour had come to a wrong conclusion.

After some further argument, it was decided that notice should be sent to the parties of the date of the new trial.

CAVERSHAM PETTY SESSIONS.

(*Before Sir* R. T. HERMON-HODGE *and a Bench of Magistrates.*)

A Company Fined for Neglecting to Supply Water.

The South Oxfordshire Water and Gas Company were recently summoned by Mrs. Julia Willoughby, of "Tanglewood," Goring, for neglecting to furnish her with a supply of water after notice had been given and the water-rate paid.

Mr. S. BRAIN appeared for the plaintiff; Mr. F. J. CHURCHILL represented the Company.

Mr. BRAIN, in opening the case, said the plaintiff had occupation of "Tanglewood" from the 7th of September, but was not residing there, as certain decorative repairs had to be carried out. These were entrusted to Mr. Woodruff, a local builder, who was under contract to get them done by a specified date. Mrs. Willoughby paid her water-rate for the quarters ending Sept. 29 and Dec. 25, and had a receipt for the latter period, though she obtained it only after considerable delay. A complaint was made by the late Chairman of the Company that there had been some dereliction of duty or some error of judgment on the part of the Contractor, and the result was that the water was cut off between six and seven o'clock on the morning of the 24th of September. From this date to the 23rd of November the house was without water; and the Company refused to restore the service—the reason assigned being the danger of contamination owing to a supply to a water-closet on the second floor. Mr. Brain said the arrangements had been in existence for fourteen years, and were in strict compliance with the law. Scores of other houses had a similar system, which was in accordance with the bye-laws of the Bradfield Rural District Council, which were in operation in the area of supply. But if the Company thought there was any fear of contamination of the water, they could have prosecuted Mrs. Willoughby under the Water-Works Clauses Act. He concluded by submitting that they had acted in a tyrannical, high-handed, and arbitrary manner; and he asked the Bench to inflict upon them the penalty of 40. a day from the time the notice was given.

Mrs. *Willoughby* was then called, and bore out the preceding statements. She produced a receipt for £1 4s. 6d. for the water-rate for the current quarter.

In cross-examination by Mr. CHURCHILL, witness denied that the sole reason given by the Company for not furnishing her with a supply of water was that she had not complied with their requirements as to the closet. She heard nothing about it except through Mr. Woodruff. It was true that he was her agent; but she did not consider that informing him of the requirements was equivalent to informing her. She acknowledged that the Company did in a letter say that the risk of contamination of their water by reason of the closet was very great.

Mr. *E. K. Burstal*, of Messrs. Stevenson and Burstal, said he had examined all the fittings at "Tanglewood," and found that they were exceedingly good—much better, indeed, than he had seen in many cases. As to the closet cistern, it was a proper one. It had a two-gallon flush, and was in accordance with the regulations in operation in the chief towns of England as well as with the Bradfield Council's bye-laws. There was no risk of contamination whatever. He had never heard a more absurd suggestion.

Mr. *John Egginton*, a surveyor and estate agent residing at Goring, corroborated this evidence. He said the upstairs closet cistern at "Tanglewood" was perfectly safe from every point of view, and there was no risk of contamination of the water. A great number of other houses in Goring and Streatley were supplied in a similar way.

Mr. BRAIN handed the Bench the Bradfield Council's regulations, and read an extract from them. He said the model regulations of the Local Government Board on the point were exactly the same.

Mr. CHURCHILL, for the defendants, remarked that he was in a rather unfortunate position, because the late Chairman of the Company, in consequence of whose action they had taken up the position they had, was no longer with them. He was sorry Mr. Brain had opened his case by charging the Company with tyrannical conduct towards their consumers. It was their intention and desire to meet them in a reasonable way, and to endeavour to comply with their wishes as far as they could, consistently with their duties to themselves and to the public. The Acts of Parliament attached great importance to the supply of pure and wholesome water; and if a proposed consumer did not comply with the requirements laid down to prevent the contamination of water, he was not entitled to a supply. The Company, and particularly the late Chairman, thought it was a very important thing that the water for the closet should not come direct from the service pipe; and he (Mr. Churchill) contended that the Company had simply done what they believed to be right, both for their own protection and for that of the consumers.

Mr. *George H. Robus*, the Engineer to the Company, corroborated Mr. Churchill's statement as to their view regarding water for sanitary purposes being separately supplied, owing to the risk of contamination otherwise. He said it was true that a former Manager did not enforce their regulations, with the result that the builders of Goring did exactly what they thought fit. The Company's contention was that if closet water came direct from the main, foul air would find its way into the pipe, and contaminate the supply.

The CHAIRMAN: Was there building going on which would have enabled the lady to make an alteration in the closet arrangement?

Witness: A pipe was being repaired.

Mr. BRAIN: There was no alteration at all. It has been like this for fourteen years.

In cross-examination by Mr. BRAIN, witness admitted that no bye-laws had been made by the Company, under their Special Act, for the purpose of preventing waste, misuse, undue consumption, or contamination of water. Bye-laws had been submitted to the Local Government Board; but they were not approved, and were still in abeyance. He disagreed *in toto* with the evidence given by Mr. Burstal and Mr. Egginton.

In answer to a question put from the Bench, witness said he could not give any specific case where the conditions he had mentioned in detail (as to a vacuum being caused when the main was emptied, and the foul air entering the empty main) had occurred.

In re-examination, witness denied that the Company had displayed any vindictive spirit whatever in taking up the position they had.

The Bench retired. On their return,

The CHAIRMAN announced that they thought there had been a serious failure of duty on the part of the Company, who would be fined £2, and £2 a day from the 11th of November (the date when written notice was given them) until the water was turned on.

Mr. BRAIN applied for costs, and for Mr. Burstal's fee as well. He also asked the Bench to allow the Solicitor's fee; contending that Mrs. Willoughby ought not to fight this test-case at her own expense.

Mr. CHURCHILL objected.

The Magistrates, however, allowed the prosecution ten guineas costs, which brought up to £36 10s. the total penalty, inclusive of the day of hearing.

TOWER BRIDGE POLICE COURT—Thursday, Dec. 5.

(*Before Mr.* JOHN ROSE, *Magistrate.*)

Metropolitan Water Board and "Farmed Rates"—Question as to the Liability of Occupier or Owner.

A case of some importance was decided last Thursday by Mr. Rose, sitting at the Tower Bridge Police Court, at an adjourned hearing of 22 summonses taken out by the Metropolitan Water Board against consumers for non-payment of water-rate. The point involved was whether the Board could recover against an occupier where the owner of the premises paid all rates (including the water-rate), and other outgoings, and had in the past paid the Board on their written demand. The Board contended that, though they had been in the habit of receiving the rates from Mr. Day, he was not liable in law, and the arrangement was merely a matter of agreement, which the Board had put an end to. For the defendants (the occupiers), on the other hand, it was argued that Mr. F. Day (the owner) was still the responsible party. The facts of the case will be gathered from the report of last Thursday's proceedings.

The Water Board were represented by Mr. COLLINS, their Assistant Solicitor, while Mr. GEORGE KEBBELL appeared for defendants.

Mr. KEBBELL, at the outset, referred to Fulton's Act, which, he said, provided that, where the owner and not the occupier was liable by law or by agreement with the company for the water-rate, the company should not cut off for non-payment of the rate, but that the rate should be a first charge upon the premises; and, without prejudice to such charge, the rent might be recovered, with the costs, either from the owner or the occupier for the time being. Then came words which were of the greatest importance: "Provided always that proceedings shall not be taken against the occupier until notice shall have been given to him or left at his dwelling-house to pay the amount due for water-rate out of the rent then due, or that might thereafter become due, from him, and he shall have omitted so to pay such water-rate." In the present case, there had been no evidence adduced of any such notice having been served on the occupier; and he (Mr. Kebbell) submitted that this was fatal to the summonses. They could see very well why the Legislature enacted this.

The MAGISTRATE: If the notice was, in fact, served, and your opponents omitted to prove it, you would not put them to the trouble of taking out fresh summonses for that?

Mr. KEBBELL: I understand they cannot prove it.

Mr. COLLINS: My friend is assuming the owner is liable by law or by agreement. It was for the purpose of hearing evidence as to this that the case was adjourned.

The MAGISTRATE: You want to show the owner is liable?

Mr. KEBBELL: It is quite immaterial. You cannot take proceedings before giving notice. Continuing, he said he would call attention first of all to section 53 of the Water-Works Clauses Act, 1847. This section defined who was entitled to a supply, and it provided that: "Every owner and occupier of any dwelling-house or part of a dwelling-house within the limits of the Special Act shall, when he has laid such communication-pipes as aforesaid, and paid or tendered the water-rate payable in respect thereof, according to the provisions of this and the Special Act, be entitled to demand and receive from the undertakers a sufficient supply of water for his domestic purposes." Therefore by this section—and there was a similar one in the Lambeth Act—an owner could enter into a contract with a company for a supply of water; and this was exactly what took place in the present case. In a statement of claim in an action pending in the High Court against the owner of these very houses, Mr. Day, the Water Board alleged that the defendant, as owner of the premises, addressed applications to the Lambeth Company to supply the premises with water, and thus agreed or became liable by law to pay the water-rates. Now, Mr. Day was the defendant in that action, and Mr. Day was the owner of the dwellings in respect of which the present summonses were issued against the tenants. There was the allegation that he made himself liable to the Company. That claim referred to Christmas, 1905. On March 28 of the present year, Mr. Day, having previously received demands from the Water Board for £16 15s. 6d. for two quarters' rates to Lady-day 1907, for the whole of the properties now in question, was summoned at that Court; and he paid. The particulars in the summons said:

"For the sum of £16 15s. 6d. due to the plaintiff from the said defendant for water supplied to him"—that was Mr. Day. Subsequently to that, he received demands personally for the water-rate to Michaelmas last; and he paid the rates up to that date. The receipt was made out n Mr. Day's name.

Mr. COLLINS said he was advised that no such demand note as had been referred to was in existence.

Mr. KEBBELL (continuing) remarked that this brought the matter pretty well down to date. On the previous occasion one of the witnesses called for the Board said that since Michaelmas there had been no alteration in the relations between Mr. Day and the Board. This was the evidence on which he would ask the Magistrate to say that there was a contract between the Board and Mr. Day.

The MAGISTRATE: Suppose it was suggested by the other side that they had mistaken their rights, and though they had treated Mr. Day as liable, he was not liable.

Mr. COLLINS said that, as regarded the statement of claim in the High Court action, when the Board first took over the Lambeth Company in 1904, arrears of rates existed on various properties for which they were advised Mr. Day was responsible; and the rates were then allowed to run on for a period. The action was brought against Mr. Day for eight quarters to Christmas, 1905; and the Solicitor then acting for him strenuously denied, as did Mr. Day's Manager, Mr. Coxall, that Mr. Day was liable for the amount.

The MAGISTRATE: You insisted he was?

Mr. COLLINS: Yes; and we still hold him liable for the rates up to Lady-day of this year. Continuing, he said that subsequently proceedings were taken against him for the rates to Michaelmas, 1906, when Mr. Day disclaimed liability in respect of certain houses. They were struck out; and he (Mr. Collins) then told Mr. Coxall the Board would not continue to take these rates from Mr. Day, who only paid those on which he had something allowed in respect of empties, and knocked out those on which he had no such allowance. Instructions were then given that the demand notes for the half year to Michaelmas last were to be sent personally to the tenants; and thereby the Board ceased to have anything to do with Mr. Day.

The MAGISTRATE remarked that he did not think that this would relieve Mr. Day from his liability in law.

Mr. COLLINS said he was not liable in law, as the premises were rated at £24. At the present time there was no agreement between the parties. Mr. Day's representative had always said: "I will not pay because I am liable, but I will pay on behalf of the tenants." On various occasions, Mr. Day said to him (Mr. Collins): "If I pay on behalf of the tenants, will you make me the old allowance of 10 per cent.—the old 'farming' allowance?" He, however, declined.

The MAGISTRATE said he thought there was evidence that there was no agreement between the Board and Mr. Day. What Mr. Kebbell had said did not bring the matter down to date.

Mr. *Collins* then entered the witness-box, and said that in 1905 he was instructed to take proceedings against Mr. Day for water-rates down to Christmas of that year. A writ was accordingly issued in the High Court; and a statement of claim was delivered for a sum, he believed, of about £350. He frequently saw Mr. Coxall, Mr. Day's representative, and tried to come to some amicable arrangement regarding the payment of the money; and he always strenuously denied Mr. Day's liability for the water-rates on the properties which were above £10 rateable value in the Lambeth district and £20 in the Southwark and Vauxhall district of the Board. Mr. Coxall, however, stated that, on behalf of the tenants, Mr. Day perhaps would pay; and the action remained in this position. Subsequent proceedings had from time to time been taken against Mr. Day, who, through his Manager, had always repudiated liability for premises above the values named. He had, however, made numerous payments through his Manager; but he had invariaby stated that he did so on behalf of his tenants. In January last, as the result of proceedings taken in the County Court to recover the sum of £65, Mr. Day's representative called upon witness and said that, on behalf of certain tenants, he was prepared to pay certain rates—the premises referred to being those on which he received a special allowance in consideration of the owner paying the rates. In those cases, however, in which he received no special allowance, he denied liability; and by arrangement they were struck out of the claim. The Manager then handed witness Mr. Day's cheque for £44 11s. 10d. in settlement of the action. At that time, and on many subsequent occasions, witness told Mr. Day the Board would no longer look to him for payment, and that he should give instructions for the rates to be collected from the tenants where they were liable. On this, application was made to the tenants for the rates for the half year to Michaelmas last. All such demands were collected from the tenants who had been served; and Mr. Day, after being told that only the full rate would be accepted, and not the "farmed" rate, paid the rates to the district officer on behalf of the tenants. On several occasions after that, Mr. Day's Manager asked witness to induce the Board to accept the "farmed" rate, on consideration of Mr. Day paying; but he declined. The district revenue officer, however, did subsequently accept the "farmed" rate, on consideration of Mr. Day settling up all arrears. Mr. Day's contention had been that none of the payments in the last eighteen months had been made by him; that he was no longer the owner of the property; and that Mr. Coxall was sole Manager.

Cross-examined by Mr. KEBBELL, witness said that in his view Mr. Day was liable to Lady-day last, and not since then. As long as the money was taken on behalf of the tenants, it did not matter to the Board who paid. Mr. Day had a good reason for paying; because he had contracted with the tenants to pay all rates and taxes. If the tenants had paid the water-rate in their rent it was a great injustice to them. He understood Mr. Day had offered to pay the "farmed" rate to Christmas; but he (witness) refused it. The Board did not get more by collecting from the tenants, as they then had some bad debts.

The MAGISTRATE suggested that perhaps, under the special circumstances, the matter might be adjusted by the Board accepting the former rate from Mr. Day.

Mr. COLLINS, however, said he did not see why, in this case, after having taken the rates from the tenants one half year, the Board should be asked to accept the "farmed" rate now.

The MAGISTRATE: I think you have made out your case; but still, having done so, do not you think it is a matter that could be adjusted by receiving on this last occasion the "farmed" rate?

Mr. COLLINS: You say I have proved my case. If you will enter an order for debt and costs, I shall be prepared to accept in settlement of the rate a sum equivalent to the "farmed" rate. If Mr. Day does not pay, I shall go to the tenants for the amount.

The MAGISTRATE: I will make orders against the individual tenants, because I think Mr. Collins has established his case—Mr. Collins undertaking to accept on the Board's behalf from Mr. Day an equivalent to the "farmed" rate.

Orders were accordingly made, with 5s. costs in the case of each tenant.

Damage to a Corporation Gas-Cooker Through Negligence.

At the Salford County Court, last Tuesday, before his Honour Judge Shiress Will, K.C., Mr. J. F. Thomson, of Broughton, was sued by the Salford Corporation for £2 1s. 6d., damage to a gas-cooker supplied to him on hire. The case for the Corporation was that an explosion of gas took place at defendant's house, which blew out the side of the cooker and damaged it to the extent named. It was alleged that the oven tap must have been left turned on; and that the explosion was caused by someone afterwards lighting one of the top burners. The Assistant Town Clerk (Mr. W. Jackson) pointed out that between 4000 and 5000 cooking-stoves were hired in the borough; and the case was therefore important. Mr. Davies, of Messrs. John Wright and Co., said they had a million of these stoves out. Their experience had been that very few explosions had taken place; and when they had occurred, they had been due to negligence. It was quite impossible for a cooker to explode unless the wrong tap had been turned. Mr. Thomson, wife of the defendant, stated that she was out when the accident happened; but she was certain she had not left the tap turned on after using the oven earlier in the day. It was admitted by the defendant that the Corporation's printed instructions were duly received; and his Honour said that had these been carried out an explosion or accident could not have occurred. There was negligence on the part of the hirer; and there would therefore be judgment for the Corporation for the amount claimed.

Embezzlement and Falsification Charges at Chorley.

At Chorley, last Wednesday, William Harris, late Head Book-keeper in the Gas Department of the Chorley Corporation, surrendered to his bail on a charge of embezzling £37 6s. 1d., the moneys of his employers. Mr. Aspden, who prosecuted, stated that between May 22 and Nov. 21, the prisoner's accounts showed a deficiency to the extent named in respect of the money received by him in regard to collections from automatic gas-meters. Before the matter was investigated, the prisoner admitted to Mr. Smalley, the Corporation Auditor, that they would find a deficiency of about £150; but it was found that within the last twelve months the deficiency came to £205. There were also further charges of falsification, by which it was alleged the prisoner had systematically defrauded the Corporation within the last few years of sums to the amount of £400. The case of embezzlement occupied a long time; and the prisoner, at its conclusion was committed for trial at the Preston Quarter Sessions. On Friday, the Magistrates again sat to hear the charges against the prisoner of having falsified his books on four different occasions in the years 1903, 1904, 1905, and 1906. It was alleged that he erased figures representing the accounts of the Chorley Spinning Company, Limited (each erasure representing a sum of £100), after the clerks had checked the accounts, but prior to the Auditors going through the books. At the present time, the figures were as originally entered; but the totals of the columns now showed in each case an under-addition of £100. After some evidence had been taken, the hearing was adjourned.

An Unfortunate Position at Leigh.—It is reported that the Local Government Board have refused to sanction any further borrowing powers for the Leigh (Lancs.) Corporation until a deficit on revenue account is cleared off the municipal gas undertaking. After discussing various proposals, the General Purposes Committee have decided to recommend the Town Council to levy a special rate of 1s. 6d. in the pound for one year, in order to meet the deficiency. A requisition has been presented to the Mayor asking him to call a town's meeting. Some reference to the position of the undertaking was made in the "JOURNAL" for June 4 last (p. 684).

Explosion in a Manhole at Oldham.—Some evenings ago, those persons who happened at the time to be in the neighbourhood of Market Place, Oldham, were startled by hearing a loud explosion, which resulted from the fusing of an electric light cable. The cover of a manhole and some flagstones were displaced; and the firemen endeavoured to subdue the flames by tipping a cartload of sand into the manhole. The current was then cut off from Greenhill generating station, after which the fire was soon extinguished. The tramway service was not interfered with; but considerable inconvenience was felt by users of electric light in the district. Fortunately, however, no personal injuries resulted from the explosion.

Loans and the Payment of Wages to Regular Workmen.—The Halifax Corporation have received an intimation from the Local Government Board formally sanctioning the borrowing of various sums for the purposes of their electric lighting undertaking. The Board have deducted an amount of £1019 for the wages of the workmen in the regular employ of the Corporation, paid out of loans previously sanctioned. Such payments, it is stated, are not a proper subject for the borrowing of money. The Town Clerk has been instructed to ask the Borough Member to see the President of the Board with a view to the withdrawal of the deductions, on the ground that the action by the Board in respect of such workmen has not been uniform.

MISCELLANEOUS NEWS.

WOLSTANTON AND NEWCASTLE-UNDER-LYME GAS PURCHASE ARBITRATION.

The Value of Part of an Undertaking.

At the Surveyors' Institution, on Monday of last week, an arbitration commenced between the Newcastle-under-Lyme Corporation and the Wolstanton United Urban District Council in reference to the purchase of so much of the pipes, mains, fittings, and works of the Corporation as were within the district of the Council, and subject to the provisions of the Newcastle Act of 1877 and the Wolstanton Act of 1906. The amount of the claim was upwards of £36,000.

Mr. RAM, K.C., was Umpire. Mr. CORBET WOODALL was Arbitrator for the Wolstanton Urban District Council, and Mr. W. A. VALON for the Newcastle Corporation.

Mr. WEDDERBURN, K.C., and Mr. F. N. KEEN (instructed by Messrs. Baker and Co. and the Town Clerk of Newcastle-under-Lyme) appeared for the Corporation, the claimants; and Mr. HONORATUS LLOYD, K.C., and Mr. HUTCHINSON (instructed by Messrs. Batten, Proffitt, and Scott, and Mr. E. Hollinshead, the Clerk to the Council) represented the Council.

Mr. WEDDERBURN, whose remarks were indistinctly heard by the Press, in opening the case, said the general question to be determined by the tribunal was what price was to be paid by the Council to the Corporation for the purchase by the Council of the Corporation's gas mains, pipes, and other works in the Wolstanton district. Having quoted from the Acts bearing on the subject, Counsel was understood to say that they differentiated their case to some extent from that of Burslem * by the fact that they were not parties to the special case, and it was never submitted to them, and they knew nothing about it that bound them. In his judgment, that case did not raise the point they wanted raised. That case, as he understood it, asked whether the Arbitrator ought, having arrived at the price and consideration, to add anything in respect to severance or loss of revenue. The question that arose here was not whether anything ought to be added to the price and consideration, but what were the elements to be included in the price and consideration, not additional price and consideration, and what did it cover. The point was what did price and consideration include. The question they wanted to bring before the tribunal in estimating price and consideration in accordance with the Lands Clauses Act was to have regard not only to actual structural value, but also to severance, and to various kinds of damage flowing from severance. This case differed from that of Newcastle-under-Lyme and Burslem, which had been already argued, and in which the Umpire had stated a special case. In this instance the claimants came under the Lands Clauses Act; whereas the Burslem arbitration did not. If the Umpire did not feel bound by what had taken place in the Burslem case, he would be content to allow the final decision to rest with this tribunal.

Mr. HONORATUS LLOYD said he would be quite content to argue it apart from the Burslem case; so he would not drag it in, and it would be agreed between them that the award should be absolutely final.

The UMPIRE said he would be able to deal with this matter quite apart from the previous inquiry.

Counsel thereupon agreed that the Umpire's decision should be taken, and that his award should be absolutely final.

Mr. WEDDERBURN then proceeded to deal with the heads of the claim. The first head referred to structural value; and the second, to damage claimed for severance under the Lands Clauses Act. As regarded the first, they would claim, of course, for mains, services, meters, stoves, slot installations, superintendence, and engineering. As regarded the mains, evidence would be given that they were in excellent condition, and were practically good as new. A great many of them had been laid within the last five to ten years—as late as 1900. The total figure altogether for mains, &c., came to about £7000. Then the second head led at once to the Lands Clauses Act, in accordance with which the Umpire had to give his award. It was quite clear that he was not to have regard only to the value of the mains, pipes, and other works to be purchased, but also to something else. As soon as they had reached this point, it was clear that the award was not to be confined to structural value. He was also to have regard to damage, if any, to be sustained by the owner of mains, pipes, and other works; and it could not be in the district only. They could not substitute works in the district both for lands taken and lands left.

Mr. HONORATUS LLOYD said he took everything to which the Act of Parliament applied.

Mr. WEDDERBURN said the Act applied both to lands taken and lands left. Here there were gas-works taken and works left; and just as in the Lands Clauses Act one was entitled to any damage to land left by reason of the lands taken and severed from it, it was clear that they were entitled to damage by reason of certain gas-works being severed from mains and pipes which were not taken. The Lands Clauses Act had been interpreted again and again; but the case of *Ripley v. Great Northern Railway* showed how broadly the matter ought to be looked at. He claimed that they were entitled here to something more than structural value. The other side were not taking all the works, but were cutting off the pipes at certain points, and cutting off part of the works, leaving him with the rest. What were the items of damage? The main point was that, by reason of the severance, the Corporation were left with what became of less value to them. He put the items under the following heads: First, the capital cost of the works of production. In 1906, roughly 20 million cubic feet of gas were consumed at Wolstanton. This meant works of production of a capital value of £4338. This was £220 per million, which they said was fair. Now if that was the amount of gas sold in Wolstanton in March this year, the result of the severance was that their works, by reason of the severance, became too big to this extent, unless it could be shown that they would be wanted by the fact that consumption of gas was increasing in Newcastle-under-Lyme, which they said was not the case. The result was that the severance left them with works of production which were excessive. In 1900, in view of supplying this district, they had to enlarge their retort-house, and spent £2500 upon it. Now the district was severed from them. The result was the damage in the loss of that money. Then let them take the second item—capital cost of works of distribution. By reason of the severance the mains that were left them became too large—that was to say, if they had not had to supply such a district, these mains would originally have been much smaller than they were. He thought that this came to about £692. The third item more or less followed logically from the others. If they could once show that their works became too large by reason of the severance, they had obviously more to keep up than they otherwise would have had; and therefore the third item was that their working expenses became larger than they otherwise would have been, and by reason of the severance they were damaged so far as they possessed excessive works. Then it would be said that they must try proportionately to reduce their working expenses. The answer was that they must; and the result was, according to the calculation to be given, that the expenditure of £158 a year on establishment charges was too big, and this represented damages arising also to their works. Of course, this had to be capitalized over a period during which they could not reduce the establishment charges; they could not do so all at once, or before ten or fifteen years. One of their witnesses was of opinion that it should be as high as twenty-five, and another that it should be nearer twenty years. It was a question within what number of years they could substantially reduce the working expenses. The fourth item was in respect of works. They had still to go on setting aside an annual sum to meet the loan which they originally raised to purchase the Newcastle Company. They had to borrow enough to buy the Company out. They had then to pay year by year something on account of sinking fund upon the sum originally paid for goodwill borne by the revenue from Wolstanton. The fifth item was that, by reason of the severance, the works he was left with became of less value; and this item was £12,596. By reason of the severance, he was left with works with which he would eventually make less than he should have done. It was really loss of profit flowing from severance. If he was right that the gas consumption was not increasing but decreasing, this was a loss which would have to be capitalized on a 4 per cent. basis. There was one head—namely, the solatium or percentage for compulsory purchase; and they asked for a substantial sum. The tribunal was not bound to any percentage, and certainly in this case it was a considerable hardship on the Corporation.

Mr. *Arthur Valon*, the first witness called for the Corporation, was examined by Mr. KEEN. He stated that he had visited Newcastle and inspected the works of the Corporation and the part of the district of Wolstanton supplied with gas by the Corporation. The ground had been opened in a considerable number of places in order that the condition of the mains might be ascertained, and these were throughout in good condition. The greater part of the pipes had been laid within the last ten years, and many of them within the last five. He considered therefore that the depreciation would be very slight. He defined depreciation as repairs and renewals which had accrued in the past and had not been executed. In this case, he found that the proper annual repairs had been duly executed, and the depreciation of the mains was therefore confined to that due to the age of the mains in proportion to their total life. The supply of gas by the Newcastle Corporation within the Wolstanton area comprised the districts of Silverdale, Knutton, and Basford. The depreciation of the mains in Silverdale in accordance with the average age of them, amounted to one-sixth, in Knutton to one-fifth, and in Basford to one-eleventh; but as the amount to replace this depreciation would not need to be found until the mains were actually renewed, he had discounted the sum arrived at for depreciation in each of the districts; and his total allowance from his valuation of mains amounted to £258. In valuing the services, he had taken the material actually used as shown by the books of the Corporation, and valued it at the present prices paid. The labour for laying the services he had taken at 6d. per foot, which was somewhat less than the actual amount expended by the Corporation, and had allowed depreciation at the rate of 25 per cent. Depreciation off meters was allowed at 20 per cent., off stoves at 25 per cent., and off slot installations and lamp-columns and lanterns, 20 per cent. His total structural valuation of mains, services, meters, stoves, slot installations, and lamp-posts amounted to £7469. With regard to the claim for the capital costs of works used to produce gas to supply Wolstanton, he estimated the amount to be £438. He submitted a table to show that the consumption of gas in the district which would be left to the Corporation of Newcastle, after this sale had taken place, had consistently decreased for the last four years, and was now less than it was five years ago. There was, therefore, in his opinion, no prospect of the works thrown out of use being required in the future; and consequently the amount of £4338 could not be discounted. To this latter amount he added £692 as the difference in the cost of mains within the Newcastle district used for the supply of Wolstanton over those necessary for the supply in Newcastle alone; making a total under this head of £5030. He further claimed for increased working expenses £3965, and an amount of £4455 to extinguish the proportion of interest and sinking fund due to the payment of goodwill upon the original purchase, which was at present borne by Wolstanton. In respect of the net additional loss of profit at present obtained from the Wolstanton area, he claimed £12,596.

In cross-examination by Mr. HONORATUS LLOYD as to the depreciation to be allowed on mains and services, and as to his additional claims under the heading of damage, witness said if there was damage it was in addition to the mains, pipes, &c.—if they took the structural value with mains, pipes, and fittings, then that structural value would, of course, be in addition. There was nothing in the Wolstanton district belonging to the Newcastle-under-Lyme Corporation except mains, pipes, and fittings. On his visit he found none of the mains split. Of course, he would expect to find leakage greater in the mining district of the area. He came across a leak or two. There were only small leaks in a few places; but not so many as he would expect to find in a district like this. He had not allowed anything in respect to

* See "JOURNAL," Vol. XCIX., pp. 339, 385, 454.

mains that would have to be re-laid. With regard to the claim for increased working expenses, witness said he was not aware that, since the death of the Engineer, the office of Secretary and Engineer had been amalgamated at a lower salary. If this were so, allowance must be made for it, which would reduce his claim under this head. He was claiming these working expenses in perpetuity, as there was no apparent prospect of an increase in the sales of gas within the Wolstanton area. As to the proportion attributable to Wolstanton of interest and sinking fund outstanding at the present time, witness agreed that the sale of gas in Wolstanton at the time of the transfer of the Company's undertaking to the Corporation was small; but he was dealing with the concern to-day, and not as it was 25 years ago. Asked whether the profit in the mining area would be less than the average over the whole district, he said this would probably be so, though there was no definite evidence to show it; but that, on the other hand, only a portion of the area was mining, and the profit in the Basford district might very well be in excess of the average. He had taken the average as being less liable to error than if he had endeavoured to make any correction.

Mr. *W. L. Elliot*, the Mayor of Newcastle-under-Lyme, and Chairman of the Gas Committee, in the course of a brief examination and cross-examination, said that the public lamps and lamp-posts in Silverdale and Knutton belonged to the Corporation. The rise in the price of gas in Newcastle from 1899 to 1902 was due to the fact that in those years the Corporation fitted a number of houses—about 1200—with fittings and slot-meters free. It was not taken up in Silverdale to the same extent as in his area. He attributed the fall in the consumption of gas in Newcastle to the incandescent burners. He did not think that gas had a considerable future in Newcastle. In a town that was practically built over the whole of its area, there was no scope for expansion. The town was a residential one, and only stood on about a square mile. There was little or no building land. Electricity was not going very well. It had not shown any growth.

On the resumption of the proceedings on Tuesday,

Mr. *Frank Jones* agreed generally with Mr. Valon's valuation, but thought that the claim for increased working expenses should be capitalized at ten years' purchase only. He agreed with the amount of depreciation on mains assumed by Mr. Valon, but had not taken into consideration the fact that this money would not be required for renewal until the end of the life of the mains. He had not made a separate claim for the sinking fund, but included this in his claim for loss of profit.

In cross-examination by Mr. HONORATUS LLOYD as to his reading of the clauses providing for transfer, witness said that he had made his valuation on the assumption that section 63 of the Lands Clauses Consolidation Act applied. But not being a lawyer, he left that part of it to Counsel. He was, however, of opinion that when the original clause was drafted it was never intended that the Corporation should only be bought out on payment of the structural value of the mains and pipes.

Mr. HONORATUS LLOYD, in opening his case, contended that the price or consideration which the tribunal had to determine was limited to the structural value of the mains, pipes, and other gas works within the district of Wolstanton. He argued that section 63 of the Lands Clauses Consolidation Act could not apply, as it set forth in the Act that the word "lands" was to mean "the mains, pipes, and other gas works of the Newcastle-under-Lyme Corporation within the district." It was therefore clear that there could be no claim for severance, as the whole of the mains, pipes, and gas works within the district were being bought. He also contended that clause 63 referred to purchase money, or compensation, and that "price" or "consideration" was an entirely different matter. He also pointed out that in the original Act of 1877 only the clauses of the Lands Clauses Act relating to procedure were to apply to the arbitration for the determination of the price or consideration to be paid to the Corporation, and that this was also the intention of the Act of 1906.

The following evidence was then given on behalf of the District Council.

Mr. *H. Woodall*, examined by Mr. HUTCHINSON, said that he had made a valuation of the mains, pipes, and other works, amounting in all to £5309. He had allowed 20 per cent. depreciation off mains, and, in addition, had claimed for the cost of relaying half the mains in the mining area, on the ground that they were too shallow. He had inspected 41 openings, and found several leaky places—two in Silverdale and one in Maybank; one main being split round a service connection. He had valued the services according to the list of material received from the Newcastle-under-Lyme Corporation, to which he had added 4s. per service for the cost of laying. From this he had deducted 33⅓ per cent. depreciation.

In answer to Mr. WEDDERBURN, witness said that he did not know the exact age of the mains until he heard Mr. Valon's evidence, but still thought 20 per cent. a proper figure. He had not allowed for the fact that the renewal would not take place until the end of the life of the main. His figure of 20 per cent. was an average over the whole district. He thought 33⅓ per cent. the proper depreciation to allow off services. He had assumed that a third of the life was gone, but, again, he had not allowed for the fact that two-thirds of the life still remained before it would be necessary to provide for the third which had disappeared. He thought a certain amount of the depreciation accrued from the fact of the services being laid and being second-hand.

Mr. *E. H. Stevenson* said he had made a valuation of the mains, pipes, and other gas works; and his summary showed a total of £5129. He took the depreciation on mains at 20 per cent., and had also deducted for the cost of relaying one-half the mains in the colliery district. He thought the pipes were very badly laid. He valued the services at 8s. apiece, for an average length of 20 feet; and he allowed 30 per cent. depreciation.

In cross-examination, witness said he put the life of a service at 20 years. Though some services might be older than this, the average would not be more than 20 years. He considered 4s. for laying sufficient. When he had charge of a works, a good many years ago, he had laid services at less than 6d. per yard. In answer to the Umpire, however, he admitted that the distance from the works was under a mile.

Mr. *A. A. T. Botteley*, the Manager of the Chesterton Gas-Works, having given evidence as to the openings made in the roads for inspection of mains, the case for Wolstanton was closed.

On Wednesday evening,

Mr. WEDDERBURN replied on behalf of the Newcastle-under-Lyme Corporation. He argued that the Corporation were entitled to be compensated for damage done to them by severance, on the ground of the inclusion of section 63 of the Lands Clauses Act in the Act under which the arbitration was to take place. He argued first that section 63 was included; and this being so, it meant that compensation was to be given to the Corporation for all losses due to severance of the works and mains within Wolstanton from the other works and mains belonging to them. The legal points were very intricate. Counsel reviewed them carefully and at length, after which he dealt shortly with the figures, contending that those put forward by the Corporation were based on the actual facts and the actual costs in the district.

The Umpire reserved his award.

GAS-WORKS EXTENSIONS AND PROFITS AT BELFAST.

The minutes of a special meeting of the Gas Committee which were submitted at the meeting of the Belfast City Council last week stated that the Committee had had a conference with the Cemetery and Parks Committee regarding the allocation of a portion of the low-lying ground in Ormeau Park as a site for the extension of the gas-works. After hearing the views of the Gas Committee in favour of the proposal, the Parks Committee decided to hold a special meeting to consider the matter. The Gas Committee also reported that the Finance Committee had asked for a grant of £20,000 towards capital expenditure on the City Hall; and it was resolved that £15,000 should be granted.

In moving the adoption of the minutes, Mr. J. A. Doran, the Chairman of the Gas Committee, said it might not be generally known that in the year 1880 Mr. James Stelfox, their late Manager, called attention to the greatly congested state of the works; and he was then instructed to make inquiry as to a possible site for an extension. After full investigation, with the assistance of one of the foremost London experts, they came to the conclusion that the low-lying lands in the Ormeau Park were the most suitable—he (Mr. Doran) might say, the only suitable—place for an extension. The only other spot where a sufficient quantity of land would have been available was down the Shore Road. But the foundations would have cost such a ruinous amount of money that it was not seriously considered; and besides this the situation was a most inconvenient one. Under these circumstances, the Committee came to the conclusion that if the Ormeau Park ground could be obtained, they would, in addition to building a gas-works, also erect a bridge across the Lagan for the public benefit; and, accordingly, a map was prepared showing the ground proposed to be taken, also the situation of the bridge. After all this had been done, and the Committee thought they were well on their way to the inauguration of the new scheme, there was raised by the public such a storm of opposition to the project that the whole matter had to be dropped. Fortunately, at that time the manufacture of water gas was being tried in this country; and Mr. Stelfox, with a great deal of wisdom, saw his way out of a serious difficulty by the introduction of this system. Now they had come within sight of the end of their resources again, and the whole subject had to be revived; and they, as a Committee, proposed that the Parks Committee should grant them a portion of the low-lying land in the Ormeau Park, about 38 acres—the Gas Committee to pay such a rent as would enable the Parks Committee to reserve the high ground (at present intended for building purposes) for the benefit of those who were users of the ground proposed to be taken; also, that they build a bridge across the river at their own cost, such bridge to be for the use of the public generally. He thought that the public would really be gainers and not losers by this transaction; and as it was a matter that every member of the Council should be interested in, he hoped there would be unanimity in bringing it forward. They were within view of the end of their present resources; and it would take at least four or five years to get an Act passed and carry out the work. At the present rate of increase, they would double their make of gas every ten years; so that there was no time to lose. He might say that deputations from the Gas Committee had visited many gas-works across the water and on the Continent; and in none of them was there the semblance of congestion that was in their Belfast works. The quantity of land used varied (say) from 30 to 40 acres to 200 acres; whereas in Belfast they had been trying to struggle along for years on 13¼ acres. He need hardly tell them that the labour of storing material in such a small place was a terrible waste of money. The scheme was a pressing necessity, if they purposed keeping pace with the demand which was being made upon them for the supply of gas. With regard to the grants they had been making to the Finance Committee, he had just a few words to say. A month or two ago he drew the attention of the Council to the fact that they had up to the present contributed a total of over £200,000 for public purposes; and he warned them that, owing to the increase in the price of materials, they could not possibly continue to make these grants. Notwithstanding this warning, and the fact that they had already voted £30,000 for the current year, they had again been called upon by the Finance Committee for another £15,000 to pay off the balance of the cost of the new City Hall. The Gas Committee, while sympathizing with the Finance Committee in the difficulty in which they found themselves, were not at all disposed to stand and deliver, as some of them thought this was a state of affairs that should be brought before a meeting of the Council; and it was only on the condition that he, as Chairman, should state the facts clearly at that meeting, that the resolution to make the grants was carried by a majority of one. What he wanted to say further was that they had hampered themselves for capital to carry on their business properly in order to make this grant; and he now said, by the authority of the Committee over which he had the honour to preside,

that they could not, and would not, continue these grants any longer. It was absolutely unfair to take all the profits made from the gas consumers and hand them over to the spending departments of the Corporation to do what they wished with; and he for one would not sanction it. He believed every member of the Committee had the same feeling on the matter. They had granted more than £45,000 for the year ending March, 1908. This was at the rate of over £865 per week; and the total was within £4500 of what they paid in wages last year to the many hundreds of men they had in their employment in this department. Surely some retrenchment was necessary; and he asked Committees having charge of the spending departments to hold their hands, as otherwise the ratepayers would have to suffer.

The proposal to take the land in the park was strongly opposed by Alderman M'Cormick and Alderman Bell. The former said they all remembered the injunction granted against them on account of the foul smell and nuisance from the retort-house, and they should think of what the transference of this nuisance to the Ormeau Park would mean. He did not want to go into the matter, because it would have to be fought out; but he could tell them the proposal would meet with stern and uncompromising opposition on the part of at least the three wards immediately concerned. Mr. Doran seemed to think there was no alternative; but had it ever occurred to him that by filling up the Lagan on the side of the gas-works, he might acquire a very large acreage? Again, there was a large portion of the gas-works lying derelict. The retort-house he had referred to were practically closed up. Were there no means of transforming the system so that this building might be brought into use?

The minutes were adopted.

INCREASE IN PRICE AT LEEDS.

At the Meeting of the Leeds City Council last Wednesday, it was resolved, with only a few dissentients, to increase the price of gas to every class of consumer to the extent of 1d. per 1000 cubic feet.

The proposal was brought forward by Mr. Ratcliffe, the Chairman of the Gas Committee, who said that a year ago, when the price of coal began to advance, the Committee were in the fortunate position of having over a million tons secured at absolute bed-rock prices; and it was this fact which had enabled them to go on so long without any increase. In more than a hundred places in the country, the increased cost of coal had entailed advances of from 2d. to 6d. per 1000 cubic feet; and in some cases there was an advance 2d. to 4d. six months ago. Speaking of the management of the undertaking, he contended that Leeds was doing better than the average of similar big concerns elsewhere; and whether in cost of carbonization, or the whole cost of gas manufacture, or in management charges, Leeds was along with the best. But for this, the price would have had to go up more than 1d. The increased expenditure on coal alone up the end of June next would be £17,000; and the estimated additional revenue through the increased charge for six months was £6000.

An amendment was moved by Mr. Watson, and seconded by Mr. Stockdill, to place automatic consumers on the same level as those having ordinary meters—making the charge to them 2s. 2d. instead of 2s. 5d. per 100 cubic feet. Alderman Buckle considered there was no necessity for an increase in the price of gas at present, as the Committee had simply estimated with a view to keeping up the profit to a certain standard. He saw no necessity for an increase in order to keep up the profits. Alderman Wilson said there was no desire whatever to make an undue profit. At the same time, there should be no wish to run the concern at a loss; and the Corporation could not continue to furnish gas at a fixed rate regardless of the increased cost of coal. He accepted his full share of responsibility in advocating this moderate increase.

Mr. Armitage observed, with regard to the amendment, that the Gas Committee made no profit from the houses of working men. The profit came from the big gas consumers, where there was only one large meter.

Mr. Wood appealed to Mr. Ratcliffe to withdraw the resolution temporarily, in view of a coming depression in trade.

In reply to the discussion, Mr. Ratcliffe said that the 260,000 tons of coal bought at bottom prices represented a saving of £30,000, which had been distributed among all classes of the consumers. If the new members of the Council would only make themselves acquainted with the facts of the case, resolutions on automatic meters would not be introduced with such frequency as they were.

GAS PROFITS FOR RATE RELIEF AT WIDNES.

As recorded in our "Parliamentary Intelligence" a fortnight ago, the Widnes Corporation have given notice of their intention to promote a Bill next session for obtaining various powers; among them being authority, if thought expedient, to use the profits realized by the gas undertaking for the relief of the rates, which they are precluded from doing under their Gas Act of 1875. At a special meeting of the Town Council held last Thursday to consider the Bill, Alderman Timmis, the Chairman of the Gas and Water Committee, objected to the proposed change, and said if it was adopted it would enable the profits to be used for the benefit of the property owners. It provided powers by which the gas consumer or the tenant might be asked to contribute something to the rates of his landlord. The Act of 1875, by which the profits were kept for gas-works purposes, was a most progressive one, and placed Widnes in a position such as no other town occupied. Since 1891, they had spent £79,000 of profits in extending the works; and but for the Act the sum might have been carried to the general district rate. If this had been done, they would have had to borrow £79,000, which would still be owing, with the result that instead of gas being 1s. 3d. per 1000 cubic feet, it would have been at least 2s. 6d. or 3s. It was a significant fact that every householder in Widnes now burnt gas, whereas in most other towns it was a luxury. He proposed "That the Council are unable to assent to the provisions of clause 5 of the Bill, unless a stipulation is added prohibiting the application of such funds as mentioned unless and until reserve funds have been established, and shall be always maintained to the full extent—viz., a sum equal to one-fifth of the aggregate capital expended for the time being." Alderman Wareing seconded the proposition. Mr. Welding said one-fifth of the aggregate capital at present would mean £25,000; and if this sum were maintained there would never be any money left to go towards the district rate, even if it was desired. Mr. G. Davies stated that last year the cost of the production of gas was a little more than 11d. per 1000 cubic feet, and the price to the consumers was just 11d. There were about 70 gas-engines in the town, and the users were getting their gas below cost price. The Gas Committee were accumulating profits for posterity. Mr. Lewis contended that the gas funds should be emancipated from the domination of the gas interest. He said this because he believed that the Town Council, representing the burgesses of Widnes, ought to be masters of the situation, and their judgment and discretion should be paramount in the matter. Other speakers followed, and on a vote being taken the proposition was rejected; only six voting in its favour.

BIRKDALE AND ITS GAS SUPPLY.

The subject of the quality and pressure of the gas supplied by the Southport Corporation to Birkdale and Ainsdale occupied a considerable portion of the monthly meeting of the Birkdale Urban District Council last Tuesday.

In moving the adoption of the minutes of the Lighting Committee, Mr. Pye said he ought to refer to the many complaints that had been made during the past month regarding the gas supplied by the Southport Corporation to their district. These might be specified under four heads: (1) The want of pressure in the Ainsdale Ward; (2) the illuminating power of the gas; (3) the calorific value; and (4) the disagreeable odour given off by the gas. Acting on instructions from the Committee, their Gas Examiner was carrying out a number of pressure tests throughout the district, on which he would report to the next meeting of the Lighting Committee. But he had made a statement to the effect that the pressure in the Ainsdale Ward was very poor indeed. The remedy was in the hands of the Southport Corporation, who refused to enlarge the mains laid in the Birkdale district, though the Corporation would reap all the benefit from doing so. According to section 46 of the Southport Improvement Act of 1871, the Corporation had the power to enlarge the mains to supply Ainsdale with gas. This power was still in existence; and it would certainly be less costly to them to enlarge the present main than to lay a new one, as they suggested, all the way along the Liverpool Road, which the Birkdale Council very properly refused to allow. With regard to the complaint as to the illuminating power of the gas, the Council had done their best, as everybody knew, to oppose Southport's application to use the No. 2 "Metropolitan" argand burner, which had resulted in the present low-grade gas. Really, this covered all the other points. The Southport Corporation had an agreement with the Birkdale Council to reduce the illuminating value from 20 candles to 16; but by adopting this new burner, they had reduced it to 14 candles, and sometimes to less than that. He only hoped that now there was a change in the constitution of the Southport Corporation they might have better treatment with regard to the gas supply to Birkdale, and so put an end to these constant complaints.

The motion was seconded by Mr. Collier, who remarked that they had now incandescent burners fitted to all the lamps in Ainsdale; and, so far as the street lighting was concerned, they had not very much to complain of, if they could get a little more pressure.

Mr. Wells said he would like to explain—not from Southport's point of view, but from their own—the position in which they stood. It was first proposed that Birkdale, as well as Southport, should start a gas-works. Then the arrangement was made that if Birkdale would not start a gas-works in opposition to Southport, they would put Birkdale on such a footing that they would have the gas at the same price as that at which they would supply Southport; and if Birkdale put down their pipes, they would pay Birkdale not only for the use of the pipes, but they would also give them something for the right of supply. This was only a matter of bargain between the two. The people who had the matter in hand in Birkdale sank their idea, and let Southport make the gas at their works, and agreed to take it on those terms. After a little while, Southport managed to get, by some Act or other, the right to make a differential charge. They put upon Birkdale an extra rate of 6d. more than they charged in Southport. Then the rebate of 8d. was naturally reduced by 6d. If they took Southport's version of the incident, it cost them 7½d. to pay off the principal and interest on their borrowed money for the pipes. Where was the difference? Birkdale got ½d. This meant for Birkdale something like £355. Last year, he was given to understand, Southport put £13,000 to the relief of the rates in the town. The Corporation wanted Birkdale to pay the cost of increasing the capacity of the mains to improve the gas supply of Ainsdale, so that Southport could get the benefit; but if Southport wanted Birkdale to pay the cost in that form, and wanted them to lay down the pipes, let them give to Birkdale the return they ought to have if they supplied Ainsdale in the same way as Southport supplied Birkdale.

The Chairman (Mr. W. H. Hayes) said he should like to supplement the remarks that had been made. All that had arisen was owing to a very simple letter which passed between the two bodies. Birkdale had asked Southport to give them a price at which they would supply them with gas in bulk. It was a very simple question. Southport had powers, according to clause 63 of their Act of 1900, to supply Birkdale with gas in bulk; and Birkdale's request for Southport's price for doing this had opened up the huge question and this correspondence—and very unpleasant correspondence—and a very unpleasant feeling had germinated from it.

The minutes were adopted.

KENSINGTON BOROUGH COUNCIL AND METER-RENTS.

At the Meeting of the Kensington Borough Council last Tuesday, the Law and General Purposes Committee reported that they had considered (pursuant to reference) a letter from the Islington Borough Council in regard to the recent increase in the price of gas supplied to the public lamps and the re-imposition of meter-rents by the Gaslight and Coke Company. It was stated therein that the Council had addressed a communication to the Board of Trade urging that a Government inquiry should be ordered into the administration and expenditure of the Company, with a view to the protection of the public interests and the prevention of further charges being made; also that they had conveyed to the London County Council their regret that they should, without consulting the Metropolitan Borough Councils, have concurred in the re-imposition of meter-rents. The Committee had also had before them a letter from the Finsbury Borough Council, intimating that they had made representations to the Board of Trade, urging the necessity for a searching inquiry into the management of the Company, with the view of ascertaining what was the cause of their action. In connection with the Committee's consideration of the communications, their attention had been directed to the fact that it was absolutely necessary that the Company should take some steps to secure additional revenue in consequence of the increase in the price of coal and oil, and that two alternatives were open to them—either to increase the price of gas by an additional charge of 1d. per 1000 cubic feet, or put on again meter-rents, which had not been charged since 1894. It appeared that in connection with legislation introduced in the session of 1903 for fixing the price of gas, negotiations took place between the Company and the County Council, as the outcome of which a Bill promoted by the Company to fix 3s. 4d. per 1000 cubic feet as the standard price for gas supplied to ordinary consumers instead of 3s. 9d. was passed, and one promoted by the Council abandoned. In the course of the negotiations, a suggestion was made that the Company should give up their power to re-impose meter-rents. But this was objected to by them; it being stated on their behalf that it was not the policy of the Company to charge meter-rents, and that they had no intention of doing so in the case of ordinary consumers. It was further contended that the right to charge meter-rents should not be taken away from them while it was exercised by the other Metropolitan Gas Companies. It was in the light of negotiations referred to that it was thought that any subsequent change in the Company's policy might, if adopted without the consent of the London County Council, be regarded as a violation of the understanding arrived at in 1903; and it was to avoid any such possible misinterpretation of their action that the Company approached the Council with the proposal that the question of charging meter-rents should be re-opened. The additional charge which would be thrown upon the consumers by putting on meter-rents was estimated as equivalent to an increase of ¾d. per 1000 cubic feet in the price of gas; but it was pointed out that the increase would not affect consumers who have prepayment meters, as they already pay for the use of their meters in the form of an additional charge for gas. It was, moreover, contended that a meter-rent charge was a fairer one than an increase in the price of gas, inasmuch as the rents would be payable by the ordinary consumers, many of whom merely use gas as a stand-by, and had meters which were idle, entailing outlay for which the Company had practically no return, and which had therefore to be borne by the whole body of consumers. While the increased charge would be equivalent to an additional ¾d. per 1000 cubic feet of gas, the Company had given an undertaking to the County Council—and it was to be embodied in the Company's next Act—that the authorized dividend should in future be calculated as if the price of gas were 1d. per 1000 cubic feet higher than that actually charged; this being, in effect, a reduction of 1d. in the standard price. The Council, in acquiescing in the proposals of the Company, were of opinion that they were acting in the best interests of the public, especially as meter-rents were charged by the other Gas Companies in and around London, and the necessary increased charge consequent on the advance in the price of coal would be levied in what could not be considered an inequitable manner. Having regard to the foregoing facts, and after a careful investigation of the question, the Committee inclined to the view that the arrangement which had been made was one to which the Borough Council could not reasonably take exception; and they therefore recommended that no action be taken on the letters submitted to them. This was agreed to without discussion or dissent; and it was arranged that copies of the report should be sent to the other Borough Councils, in order to remove the misapprehensions which exist as to the matter.

The Street Lighting Sub-Committee reported that, in view of the rent now charged by the Gaslight and Coke Company for the use of meters in connection with the various offices and buildings, they had considered the advisability of the Council purchasing the meters required. The Lighting Engineer had informed them that the annual sum now payable as meter-rent was £28 4s. 4d. Quotations had been received from three firms for the supply of 39 dry gas-meters under a guarantee for five years; and the Engineer estimated the cost of fixing them at £11 2s. The average life of the meters would be ten years. Spreading this sum, together with the total of the lowest of the quotations sent in, over the period named, the annual charge would come to £19 7s. 11d. Looking to the fact that the Council already owned meters used for registering the quantity of gas consumed in the various streets and places in the borough, as well as those at some six of the premises controlled by them, the Sub-Committee were of opinion that it was desirable that the whole of the meters in connection with the supply of gas should belong to the Council. They therefore recommended that the quotation of Messrs. Parkinson and W. & B. Cowan for the supply of 39 dry meters for £182 17s. 2d. be accepted. This was agreed to.

Cardiff, shortly after seven o'clock in the evening last Saturday week, experienced the inconvenience of a stoppage of electric current for a period of about a quarter of an hour over a portion of the district, owing to "one of the power feeders temporarily giving out."

METROPOLIS WATER SUPPLY.

Provision for the Future.

At the Meeting of the Metropolitan Water Board last Friday—Sir MELVILL BEACHCROFT in the chair—the report of the Works and Stores Committee on the future water supply of the Metropolis, a summary of which was given in the "JOURNAL" for the 26th ult. (p. 657), was further considered. The principal recommendations of the Committee, it may be remembered, were: "(1) That in the opinion of the Board it is desirable to seek parliamentary powers enabling them to provide additional supplies from the Thames for as long a period as is economically practicable; and (2) that in any proposition which may be put before Parliament dealing with the Board's future requirements powers should also be sought to acquire an auxiliary gathering-ground for use after increased supplies from the Thames are no longer economically available."

The CHAIRMAN reminded the Board, at the opening of the discussion, that the object of the Committee's report was to obtain some expression of opinion which might serve as a guide to them in any scheme which they might bring forward; and he pointed out that at this stage it would be most unwise for the Board to tie themselves down too rigidly. No one contemplated the abandonment of the Thames as a source of supply; and, to his mind, the question resolved itself roughly into one of economy. It had always seemed to him that Welsh water stored in Wales would be no better than Thames water stored on its banks.

Dr. BEATON moved an amendment to the first recommendation, the effect of which was that the Board should express the opinion that parliamentary powers should be sought for the provision of additional supplies both from Wales and the Thames. He said he did not argue that Thames water was impure; but with water from Wales there would be no risk. Whatever was done, an auxiliary supply would be needed by 1961; and then, in all probability, the Board would have to go to Wales for it. As it would take twenty years to prepare for such a supply, there was not a very large margin of time. Sir Alexander Binnie's scheme for bringing water to London from Wales was estimated to cost £38,000,000; but it could be divided, and a supply of 200 million gallons secured from Wales for £18,000,000. While the Chief Engineer to the Board estimated that his scheme for drawing increased supplies from the Thames would cost £6,250,000, it might cost three or four millions more if they considered the necessity for pumping, which would not be needed in the case of a Welsh supply. In any case, a "stand-by" area in Wales would be required; and it would have to be secured now.

Mr. WARD, in seconding the amendment, pointed out that not only had the needs of the Board's own area to be considered, but those of the authorities immediately outside; while the supply derived from wells was rapidly diminishing.

Mr. E. B. BARNARD, M.P., the Chairman of the Committee, pointed out that if the population did not increase at the estimated rate, the requirements would, under the scheme, be dealt with as they arose. As to the supply from wells, it was recognized by the Committee that this had reached its limit. Referring to the cost of works which would have to be constructed, he maintained that, however the matter was considered, the financial arguments were in favour of continuing to use the Thames supply. The Committee believed the scheme proposed was the best; and it had been looked at with a tender regard for considerations of health.

On the amendment being put, it was supported by only three members, and was consequently lost.

Mr. LIDIARD moved a further amendment to the effect that the provision to be made should be limited to the period expiring in 1941, as otherwise the Board might embark upon expenditure which by that year would be found to be absolutely unnecessary.

Mr. BURT seconded the motion. Speaking in the interests of Surrey, he said it was proposed to take from the Thames in 1941 300 million gallons of water a day; and to go further would, he was afraid, have an injurious effect upon the river. The Thames was the property of the nation, and not of the Water Board; and it must be preserved as a stream, and not a mere conduit.

Mr. BARNARD said the capital sum involved, whether the date fixed were 1941 or 1961, was really only a matter of the cost of the sites for the additional reservoirs, as these would only be built as they were required. It was not proposed to draw any water from the Thames unless there was a flow of at least 200 million gallons over Teddington Weir.

The amendment was lost (only four voting for it), and the Committee's first recommendation approved.

The second recommendation was then submitted.

Mr. KARSLAKE moved, as an amendment—"That as the increase in population will eventually render resort to some other source than the Thames watershed imperative, the Board view with great alarm the increasing tendency of authorities throughout the kingdom to appropriate water-supplying areas for their own particular use, and, in these circumstances, desire to urge upon Parliament the necessity for regulating the appropriation of water-supplying areas, so that the needs of the Metropolis as well as of other populous places may receive due consideration." He moved further that a copy of this resolution be sent to the President of the Local Government Board, with a request that he would receive a deputation from the Water Board on the subject. In support of his proposals, he argued that the matter should not be regarded from the point of view of London only, but from that of the whole country. He reckoned the water-bearing capacity of all the mountain ranges of Wales at 1000 million gallons a day, from which there had to be deducted nearly 100 million gallons which were being taken by large corporations—a considerable portion of the gathering-grounds having been already bought up or earmarked. He estimated that in sixty years the population of the country would have increased by 30 millions, and that this number would consume practically the whole of the available supply from Wales—the result being that in 1961, when the Board would have to seek a fresh supply, it would not be obtainable in Wales. He contended it was the duty of Parliament

to safeguard the sources of water supply so that they might all be used with the best advantage to the greatest number of people; and he suggested that the Government could do much by the prevention of pollution, economical administration of the supplies, and afforestation, which itself would increase enormously the water reserves of the country.

Mr. MUSGRAVE, in seconding the amendment, remarked that if the Government did nothing in response to the Board's suggestions, it was open to them to deal with the question of a supplemental supply as it arose.

Mr. BARNARD said a speech recently delivered by the President of the Local Government Board appeared to foreshadow something in the direction indicated in the amendment; but it seemed obligatory upon the Committee to leave the question for the Water Board's decision as to whether they should try to secure a water-bearing area or represent to the Government the view that, unless they saw their way to institute some central authority as the custodian of such places, the Board might have to try to secure such an area, though upon a point of principle they might not desire to do so. The Committee were prepared to accept the amendment.

Mr. PRITCHARD urged that it was the duty of the Board, and not of the Government, to provide water for London; and he said he thought a Welsh watersbed should be secured as a sort of insurance policy.

The amendment was carried by 24 votes to 8, and adopted as a substantive resolution.

The Works Committee were then instructed to prepare and submit to the Board a scheme for the provision of additional supplies from the Thames.

PRESENTATION TO ALDERMAN GAINSFORD (SHEFFIELD).

Last Wednesday evening, the retirement of Alderman T. R. Gainsford from the chairmanship of the Water Committee of the Sheffield Corporation was signalized by the presentation to him of an illuminated address, accompanied by a beautiful silver inkstand and candelabra, by members of the staff, as a mark of the respect and esteem which his twenty years' administration of the water undertaking had engendered. The presentation was made in the Lord Mayor's Parlour, in the presence of his Lordship, who presided, the ex-Lord Mayor (Alderman R. Styring), who is the new Chairman of the Water Committee, Mr. C. F. Bennett (Vice-Chairman of the Committee), and Mr. William Terrey (General Manager), and about seventy of the employees. The signatories to the address, in addition to Mr. Terrey, were Mr. L. S. M. Marsh (Engineer), Mr. J. J. Walker (Accountant's Department), Mr. F. J. Dickinson (Rating Department), Mr. W. J. Martin (Distribution Department), and Mr. W. Pitchford (Plumbing Department).

The address alluded in the following terms to the progress of the Water Department under Alderman Gainsford's supervision:

> During the twenty years of your administration, the Damflask reservoir has been completed and brought into use, the Little Don Valley scheme has been inaugurated, and the Langsett and Underbank reservoirs constructed; and as the result of the memorable parliamentary contest in 1899, a substantial share of the waters of the Derwent have been acquired—thus making ample provision for the future requirements of the city and district. The water supply has been improved by the adoption of simple means for the prevention of its action on lead, and the water-rent charges reduced by the abolition of the 25 per cent. added in 1864; while the remarkable progress and development of the undertaking has placed it among the largest and most successful municipal enterprises in the kingdom.

The presentation was made by Mr. Terrey, who referred to the growth of the water undertaking during the past twenty years, and contrasted its position in 1887 with that occupied in March last. He said the population supplied in 1887 was 313,000, and it was now upwards of 500,000. The daily supply was 6 million gallons, as compared with 14 millions now; and it was remarkable that in 1887 the total trade supply was only 1,738,000 gallons a day, whereas now the daily supply for manufacturing purposes was 7,752,000 gallons. The total number of supplies in 1887 was 80,000, and now it was 186,000; the gross revenue was £83,310, compared with £188,139; the gross profits were £69,086, against £155,961; and the net profits were £5971, against £66,322, or nearly 1200 per cent. increase. Since the transfer of the water-works to the Corporation, no fewer than nine Acts of Parliament relating to the improvement and extension of the supply had been obtained. Alderman Gainsford's motto was not only "Purity and Plenty," but "Cheapness;" for since the reduction of the charges the supply of water was as cheap as any in the country. Mr. Terrey concluded with an expression of good wishes to Mr. and Mrs. Gainsford from all those whose privilege it had been to be associated with him.

The Lord Mayor (Alderman H. P. Marsh), on behalf of the citizens and members of the Council, associated himself with Mr. Terrey's remarks, and expressed unbounded appreciation of the work done for the city by Alderman Gainsford during the 36 years he had been on the Council. Since the acquisition of the water-works, he had been ever watchful of the interests of the department. Though he was vacating the office of Chairman, he was not leaving them; and all hoped that for many years he would be able to give the benefit of his knowledge to the Water Committee and the Derwent Valley Water Board.

Alderman Styring attributed the success of the water undertaking very largely to the fact that they were fortunate in getting as their first Chairman a gentleman of Alderman Gainsford's capacity. He did not suppose it would have been in the slightest degree probable that he (Alderman Styring) would have occupied the chair of the Water Committee had it not been with Alderman Gainsford's full approval and sanction. He concluded by attributing some of the success of the Water Department to Mr. Terrey, whom he described as one of the most successful administrators of muncipal undertakings in the country; and he said it was a source of satisfaction that they would still have his able guidance and the loyal support of the staff.

Alderman Gainsford, who had a very cordial reception, acknowledged the gifts, which, he said, he would value highly, together with those he received from his colleagues on the Committee three or four years ago, as a record of the twenty years' municipal work he had been able to offer to his native city. Though he left them as the first Chairman of the Water Committee, he left them in good hands, for there was practically not any change on the Committee; and, above all, they had the same Mr. Terrey and the same Mr. Marsh—the best friends they could possibly have. Every man, he held, who did his work well was as much deserving of recognition as another. It was not a question of how high or how low his position; it was a question of how each man did his work. In conclusion, Alderman Gainsford said the gifts he had received would never be more present than the kind recollections he would retain for everyone in his heart.

Thanks were accorded to the Lord Mayor for his presence, and the proceedings closed.

PORTSMOUTH WATER SUPPLY.

The New Filtration Works.

In the report of the recent half-yearly meeting of the Portsmouth Water Company which appeared in the "JOURNAL" last week (p. 726), reference was made to the new filtration works which are to be carried out by the Company. We learn from a local paper that they will be situated at Farlington, on Portsdown Hill, about 4¼ miles north-east, in a direct line, from the Portsmouth Town Hall, and at an elevation of about 150 feet above sea level. Their exact position is immediately to the east of the Company's existing storage reservoirs. The ground at the site of the works slopes gently from north to south, and the filter-beds, seven in number, with a total combined area of 3 acres, will be cut into the Hill at their northern end, while their southern end, which will be above the present ground level, will be situated over, and form part of, the roof of the northern half of the two new service reservoirs which are to be built in connection with the scheme, and will be supported from the floors of these reservoirs by means of brick walls and concrete arches.

The water derived from the Company's springs at Havant and Bedhampton will still, as now, be pumped direct to Farlington, where, after flowing through the new filter-beds, it will be stored in the new and the existing service reservoirs, and passed from them by gravitation to the whole of the area supplied by the Company, which comprises, in addition to the borough of Portsmouth itself, together with the dockyard and all the establishments situated therein—a number of country parishes and districts—the whole containing a population of over 220,000. The water will therefore be filtered at the last moment before being distributed; and inasmuch as both the old and the new reservoirs will be covered, the water will never see daylight again until it is drawn from the consumers' taps.

The filter-beds will consist of large rectangular water-tight tanks constructed of brickwork and concrete, and will each approach half-an-acre in area and be about 9 feet deep. The filtering material will be composed of 3 feet of fine sand, superimposed and resting upon a 9-inch graded layer of shingle. This will rest upon a flooring of brickwork, in which will be formed channels to convey the water after filtration to the filter outlets, and thence to the service reservoirs.

The water to be filtered will be pumped in at the northern end of the filters, and received in specially constructed chambers, from which it will be distributed over the surface of the sand, on which it will lie, to a depth of about 3 feet. It will be permitted to sink through the sand and shingle into the collecting channels beneath, and thence to the reservoirs, at a certain uniform rate, which will never be exceeded; thus ensuring filtration of the highest possible efficiency. From the filter-beds the water will pass through automatic regulators to either the new or the existing reservoirs, or both, and thence direct by gravitation to the consumers.

The northern part of the two new reservoirs which are to be constructed in connection with this scheme will be situated, as already mentioned, underneath the southern end of these filters; while their southern portion will project beyond the filters, and be covered by a roof of ferro-concrete on the Hennebique system. The two existing reservoirs belonging to the Company, and situated close by, are to be covered with a roof of the same material, as are also the two small reservoirs, about ¾ mile off, at nearly 300 feet above the sea level, into which the water utilized by the majority of the consumers in the country districts is pumped.

The whole scheme has been designed on the latest scientific principles; it being the Company's desire that no expense should be spared which might be necessary to secure the highest possible efficiency. It is interesting to note that the construction of the works will involve the excavation of no less than 70,000 or 80,000 tons of solid chalk and other material, the provision of nearly 30,000 tons of concrete, and the supply and use of between 3 and 4 million bricks, in addition to upwards of 20,000 tons of filtering material. Apart from this, there is, of course, an immense quantity of ironwork of every description, and other material and apparatus.

The designs for the works were prepared by Mr. Herbert Ashley M.Inst.C.E., the Chief Resident Engineer of the Company, and approved, with slight modifications, by Mr. Charles Hawksley, Past-President of the Institution of Civil Engineers, and Professor Percy Frankland, F.R.S., the President of the Institute of Chemistry. As mentioned last week, the whole of the work has been entrusted to Messrs. John Mowlem and Co., Limited, of Westminster; the amount of the contract being £73,092.

Gas-Workers' Conditions at Rochdale.—When a recommendation by the Works Sub-Committee that an application by stokers and others employed in the carbonizing department for a week's holiday with pay annually should not be entertained came before the Rochdale Gas Committee, an amendment was moved that the concession should be granted to the regular employees, and that proportionate holiday with pay should be allowed to extra men employed during the winter season, provided they put in at least twenty weeks' work. The amendment was carried by six votes to four.

THE ARTESIAN WATER SUPPLY OF AUSTRALIA.

In the course of an article on the above subject, by Mr. C. O. Burge, which recently appeared in "Engineering Record," he furnished the following particulars.

Though the greater part of the area of New South Wales had been subject to periodical droughts, practically nothing has been done commensurate with its wants and capabilities, in the conservation of surface water, beyond surveying and reporting, until a few months ago, when a great scheme for the utilization of the Murrumbidgee River waters was decided upon. This will undoubtedly reclaim a large area of possibly drought-stricken, though otherwise fertile, land. Victoria, though her needs are not so great, owing to a generally more regular rainfall, has been somewhat more vigorous in the past; but, taken as a whole, irrigation has been exceedingly neglected throughout Australia. The prospects of the Commonwealth, therefore, are all the more hopeful now that some substantial efforts in this direction are being made, showing that if, generally, a prosperous career has, so far, been the characteristic of the Southern Continent of the British Empire, how much more will this be the case under the newly-awakened condition of its inhabitants as regards the value of water.

Among these substantial efforts are the utilization of the artesian water which has been going on for some time in Queensland and New South Wales; and, though the quantity of water from bores is insignificant, as compared with that from surface supply, and though it is limited to the artesian area, large as that is, yet a great deal has been done, chiefly in the direction of watering stock. An ideal artesian basin is only to be found where the water-bearing strata dip in the middle of the area, outcropping all round at a higher level than that of the surface at the sites of the bores. Most of the artesian basins known throughout the world, however, are not of this ideal character; there being a break in the continuity of the porous outcrop somewhere, leaving a leakage, which more or less seriously draws away some of the supply otherwise released by the bore. The great artesian basin of Australia is of this latter type, the intake beds outcropping along its eastern and north-eastern sides only, while the remainder of the water-bearing formation leaks into the Gulf of Carpentaria, or is hidden under the superficial deposits forming the plains of the interior of the States.

With a map of Austraiia before us, we can easily trace the boundary of this great area. Beginning at the south-western coast of the Gulf of Carpentaria, it runs irregularly southward to the 25th parallel of latitude, thence westerly to about 133° east longitude, thence south to the 31st parallel, along which it bears easterly, but with many indentations, to near the town of Dubbo, in New South Wales, which is the south-eastern limit. The eastern and north-eastern boundary, from which the chief supply comes, is roughly parallel to the east and north-east coast, about 150 miles from it in New South Wales, and over 200 miles in Queensland; joining the coast again about 100 miles from Cape York, on the eastern side of the peninsula of that name.

The greater portions of this area are in Queensland (376,000 square miles) and in South Australia (110,000 square miles); but in the latter it is mostly in an undeveloped and unexplored territory, while the smallest portion (83,000 square miles) included in the area in New South Wales is a settled, though not populous, district. The area of intake beds is about 50,000 square miles in Queensland, and 18,000 square miles in New South Wales. Victoria and Western Australia are both outside the area. Except for a strip about 100 miles wide on the eastern and north-eastern side, the area is within the zone of 20 inches annual rainfall, and further inland of the 10-inch zone; and it is the character of these zones to absorb and evaporate much of the rain falling on the surface. The Murrumbidgee, the Lachlan, Darling, and other rivers, are much larger in the middle of their course than at their outlet, where they join the Murray; the water spreading out into lagoons between these points, and being lost largely by evaporation.

To return, however, to the artesian area. This has, in the opinion of some experts, ocean outlets not only at the extreme north, as shown by the description of the area given above, but also to the great Australian Bight, to the south; but the latter view is disputed, and Professor Gregory, of Melbourne, opposes it. In his recent work, "The Dead Heart of Australia" (1906) he says: "The only available outlet is northward over a rock barrier into the Gulf of Carpentaria, or possibly eastward to the South Pacific. The fact that the main artesian basin has no regular outlet and is enclosed by a rim complete to west and south, and has only a narrow, shallow lip to the north, and perhaps another to the east, shows that the deep central waters are old accumulations. The wells are the modern artificial outlets from a vast reservoir, which is almost entirely enclosed, and the waters discharged from it must have been collected during the course of centuries and probably of past millenniums. Nature has stored up a vast, but probably a limited, supply in a safe underground reservoir. That water, if prudently used, would probably last till Central Australia was so well occupied that it could afford to provide a more costly supply." As to leakage from the basin, Mr. Pittman, the Government Geologist of New South Wales, points out that any accumulation of water, underground or surface, must eventually become salt, unless it has an outlet, due to dissolution of saline matter from rocks or soil, and that therefore all artesian basins affording potable water must have leakage.

A recent interesting and voluminous paper on the artesian resources of New South Wales, by Mr. Percy Allan, M.Inst.C.E., of the Roads and Bridges Department, Sydney, read at the University of Sydney, and the valuable annual reports of Mr. J. B. Henderson, M.Inst.C.E., Hydraulic Engineer to the Queensland Government, enable fairly up-to-date figures to be given on this subject. The first bore in New South Wales was in 1879 on the Killara Station, between Boweke and Wilcarmia, which, though successful, was on a small scale, being only 140 feet deep; but the owner of Kerribee Holding, near Bourke, followed with one of 1073 feet, yielding 350,000 gallons per day. The Government started work in 1884, and up to the date of the latest figures there are 412 bores, of which 41 have been failures. Of these bores, 130 have been put down by the Government. The deepest bore in the State is that at Dolgelly, near Moree, 4068 feet deep; but the finest example, taking the flow into consideration, is the Euraba bore, in the same district, at a depth of 4005 feet, giving a flow of 1,097,420 gallons per day, the finishing diameter being 6 inches. Mr. Allan gives the following average example, occurring at Rowena, near Walgett. This bore was sunk to a depth of 2669 feet, at a cost of $11,880. It has a flow of 924,990 gallons per diem, which, by means of 41 miles of distributing channels, constructed at a cost of $4051, including headworks, divisors, drops, and culverts, waters 55,405 acres. The total cost was about $16,195; the benefit derived, according to experts, being about $1920 per annum. The rate charged was equivalent to 0·022c. per 1000 gallons. The temperature of the artesian water at the bore mouth varies from about 78° to 135°, not always according to depth; but exposure to the atmosphere quickly reduces it, as a rule. However, the district being largely in the hottest part of New South Wales, the temperature of the air is occasionally higher than that of the water.

In Queensland, the Government were first in the field at Blackall, and there are now more than 1130 bores, of which about 11 per cent. were put down by the Government. Many inland towns are supplied with water from artesian bores, among them being Blackall, Cunnamulla, Aramae, Charleville, and Roma. The deepest bore is that at Bimerah, which was sunk 5045 feet, but the supply is small; while the aggregate amount of sinking for the whole State is upwards of 225 miles. The highest flow from any single well is 4 million gallons in 24 hours. Trouble, of course, arises from the presence of alkalis in both States; this being, according to Mr. Henderson, inimical to plant life when more than 30 grains per gallon are found. The mineral salts in these waters generally exceed those in the artesian supplies of America; but, on the other hand, the soil in the latter, within the districts served, is more impregnated, and the combination is frequently greater than in Australia.

It is, however, generally agreed that, with some exceptions, on account of quantity and quality, artesian water in Australia is not suitable for irrigating crops, except on a very small scale; but immense possibilities are in view from its provision for keeping stock of all kinds in good condition at all times, and in preserving life in periods of drought. A bore with a flow of 1 million gallons per diem, while only capable of properly irrigating some 400 acres, will provide sufficient water for stock purposes over an area of about 80,000 acres. Extending right through New South Wales, in all directions, are strips of country from half to one mile wide, reserved by the Government from private sale or use, through which stock travel from one part of the State to another and feed. Where these intersect artesian country, bores are provided at the public expense; there being an average of one bore to 1280 acres of the reserve. Including these, and summarizing, there are in New South Wales, according to latest figures, 114 successful Government bores, serving 2,122,254 acres, and 257 private ones, the scope of which, if in proportion, would bring the total up to 4¾ million acres, the stock on which are served by artesian water. In Queensland, whether it is by ill-luck or bad management, the proportion of successful to the total number of bores is much less than in New South Wales; 596 constitute the number of the former, these being mostly in private hands. The total daily flow is estimated at nearly 400 million gallons.

Water Charges to Traders at Manchester.

By forty-eight votes to forty, the Manchester City Council have approved of a recommendation of the Water Committee that the water-rates for the ensuing year should be raised from 2d. to 3d. in the pound for public purposes, and from 8d. to 9d. for domestic purposes. Sir Bosdin Leech, the Chairman of the Committee, pointed out that the large increase in the consumption of water had compelled the Committee to hasten the laying of the third line of pipes from Thirlmere and the construction of the Heaton Park reservoir. This involved very heavy payments; and unless further provision was made, it was estimated there would be a large deficit on revenue account on the completion of the works. By the proposed advance in the rate, the revenue would be increased by £21,000 per annum. On the other hand, however, some of the members protested against large manufacturers being subsidized at the expense of the general community. One speaker said he believed the actual cost of the water to the Corporation was something like 7d. per 1000 gallons; whereas manufacturers were supplied at 4½d. to 5d. Sir Bosdin Leech pointed out that it was the policy of the Committee to try and encourage to the district the traders, whose payments reduced the charge to the smaller ratepayer. Mr. Boyle remarked that he was opposed to the supply of water at less than cost price. The primary or domestic users had no right to be taxed for the trading or secondary users. The users outside the city were also, perhaps, not bearing their share of the cost. Sir Bosdin Leech said the small cottagers were supplied at considerably under cost price.

Prohibiting an Increase of Capital.

An important decision, says the "Electrical World," has been given by the New York Public Service Commission of the Second District, against a proposed increase of capital. The decision permits a new Corporation—the Lockport Light, Heat, and Power Company—to purchase the Lockport Gas and Electric Company and their rivals, the Economy Light, Fuel, and Power Company, of Lockport; but it forbids the new Company to issue securities for a capitalization above $700,000, equivalent to the total issues of the two old Companies. The new Company desired to issue stock and bonds to a total of $1,200,000. The decision also makes it plain that increases in the price of gas and electricity will not be permitted to follow the combination of competitive companies. The Companies have been engaged in a bitter war in Lockport, as a result of which the prices of energy for lamps and motors in the city are lower than in most cities, and it is stated below cost. The combination was planned to put an end to the war. The Commission think it quite clear that their policy, in case two or more gas or electric companies in any community are permitted to sell out their property and franchises to one newly-formed company, should be to disapprove such sale, unless the total capitalization of the consolidated or new company, whether stock or bonds, issued in exchange for the securities of the old companies, is kept down so as not to exceed the total capitalization of the vendor companies.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There was a full tale of business at to-night's meeting in Glasgow of the Western District of the Scottish Junior Gas Association. First there was the alteration of the rules, which was effected without dissent, and was immediately acted upon. The alterations now made should have the effect of improving the working of the Association, and especially the part which provides for the annual business meeting being held at the end instead of at the beginning of the session. The incoming Council will have all the summer in which to prepare for the session during which they will be in office. Hitherto the outgoing Council have had to carry out this business. The new method may make it difficult for the Treasurer to have his accounts ready for submission before the business meeting; but that is of no moment, for the accounts are dealt with by the Council, not by the Association, and the Treasurer will be able to report to them shortly after the end of the session. So that the Council will be able to have the financial abstract published in the "Transactions," as the Western District have been doing. For the sake of the uniformity which has hitherto prevailed in the Scottish Association, it might be well if the Eastern District were to consider whether they should not make a similar alteration in their rules, even though they should not go the length of increasing the number of their Council to as many as ten. The paper by Mr. T. H. Whitehead, upon pumps, was a freshly-written treatise upon a subject which is of first importance in gas-works. Mr. Whitehead is in the employment of the lessees of the chemical works at Provan; and both there and in the course of previous employment he has had a wide experience in the working of pumps for various purposes. His descriptions of the views which he showed upon the screen were altogether admirable, as were the views themselves. The resumed discussion upon the relative benefits of light and heavy charges brought out, as the President for the evening said, quite a lot of information, and information of a very interesting kind. The President is satisfied that the last word has not been said upon the subject, as, indeed, it has not, and in all probability never will be. But the discussion of such a subject is at all times productive of good, which will doubtless be the case here; and particularly so if it should lead to the further research and experiment which the President desiderates. Mr. J. Napier Myers, of Saltcoats, in the explanation he gave of his position, somewhat took the edge off what he said a month ago; but his explanation brought out the interesting situation that, whether the charges be long or short, the profit resulting varies very little. Therefore it is to be concluded that the relative advantages or disadvantages of the two methods of carbonizing are to be aojudged upon other considerations than those of profit or loss.

The "Dundee Advertiser" on Tuesday contained the following: "The mystery of the missing cash-box, abstracted from the Dundee Gas Office by cunning hands, remains unsolved. The office staff, collectively smarting under the imputation cast upon their honour, have decided that the affair cannot be allowed to remain where it is. Last night an informal meeting of the staff was held in connection with the matter. The feeling was that, pending the findings of the Committee of Investigation, it would be inadvisable to take any action, but that, failing a report which removed the stigma under which the staff rested, a fuller inquiry should be called for."

In the Aberdeen Town Council on Monday, Councillor Gray moved that it be remitted to the Gas Committee to report as to the running of the Gas Department's locomotive engine on the public streets, and as to whether the working of the engine could not be confined to the daytime. The remit was agreed to.

One of the first, and probably not the least onerous, of the duties of Mr. L. Hislop, of Uddingston, as Joint Secretary of the North British Association of Gas Managers, has been the issue of the annual volume containing the report of the "Transactions" at the annual meeting of the Association, and of the Statistical Report of the Gas Supply of Scotland. The report of the annual meeting leaves nothing to be desired; but the preparation of it is, of course, in the hands of one engaged for the purpose. I am sorry to say that the statistical report is not so accurate as could have been wished. The report deals with the year from Aug. 1; and in the twelve months ending July 31 of this year I find, from my imperfect records of the prices of gas, that in at least eleven cases the prices entered are not those which are now in force. That is to say, changes in price were made in that number of places prior to the end of July, which are not given. It may be that those who furnish the particulars for the statistical report did not give the necessary information to the compilers, and that the blame for the inaccuracies must rest upon other shoulders than the Joint Secretaries. Or it may be that the unfortunate circumstances of the office have interfered with the compilation. But, whatever the cause, there are inaccuracies, which is to be regretted, as the value of the work is by them greatly lessened for the purpose of reference.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 7.

Sulphate of Ammonia.

There has been no recovery from the weakness which has prevailed during the past few weeks, demand being scarcely equal to supply, and prices are again easier. There have been direct orders; but they have been scarce, and buying is still mainly for covering contracts. The quotations have consequently declined to £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. Makers have shown more interest in the forward position, and there have been sellers for January-June delivery at £12 2s. 6d. per ton f.o.b. on the east coast. At this price, however, buyers have not been attracted; and in the meantime sales have been made abroad, speculatively, at under the equivalent of £12 per ton f.o.b.

Nitrate of Soda.

This article is quiet at 11s. per cwt. for 95 per cent., and 11s. 1d. for refined quality, on spot.

LONDON, *Dec.* 9.

Tar Products.

Tar products are still quiet, and there will not be much revival until the New Year. Pitch is still easy in tone. London makers are very well sold; but in the provinces low figures have been accepted for

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 763.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
268,324	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Oct. 30	7	Bombay, Ltd.. . . .	6½—6¾	..	5 3 8
40,000	5	,,	7	Do. New, £4 paid	4½—5	..	5 12 0
50,000	10	Aug. 29	14	Bourne- mouth Gas and Water 10 p.c. . . B 7 p.c. . Pref. 6 p.c.	27½—28½	..	4 18 3
51,810	10	,,	7		16¼—17	..	4 2 4
53,200	10	,,	6		14½—15½	..	3 17 5
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	243—248	..	5 0 10
300,000	,,	,,	9¾	Do. New . . .	182—187	..	5 1 7
50,000	,,	,,	5	Do. 5 p.c. Pref. .	115—120	..	4 3 4
206,250	,,	June 13	4	Do. 4 p.c. Deb. .	100—103	..	3 17 8
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	205—215	..	5 4 8
246,320	,,	,,	8½	Do. A. Ord. Stk. .	153—158	..	5 4 5
460,000	20	,,	10	British	39⅜—40½	+1	4 18 5
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c. .	116—119	..	5 0 10
165,700	,,	,,	4¾	Do. do. 3½ p.c. .	87—90	..	5 0 0
500,000	10	Oct. 11	7	Buenos Ayres (New) Ltd.	10½—11¼	..	6 4 5
250,000	Stk.	June 27	4	Do. 4 p.c. Deb. .	91—93	..	4 6 0
150,000	20	July 12	8½	Cagliari, Ltd.	26—27	—½	6 2 3
100,000	10	—	—	Cape Town & Dis., Ltd.	6—8	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref., .	7—9	..	5 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48—50	..	6 0 0
100,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	94—96	..	4 13 9
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord. .	108—110	..	4 10 11
1,443,280	Stk.	,, 29	5⅛	Commercial 4 p.c Stk. .	100—105	..	4 19 0
560,000	,,	,,	5	Do. 3½ p.c. do. .	98—103	..	4 17 1
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	109—114	−1	5 14 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
460,170	Stk.	—	5½	Derby Con. Stk. . . .	—	..	—
55,000	,,	—	4	Do. Deb. Stk.	—	..	—
486,090	10	July 31	12	European, Ltd. . . .	22½—23½	..	5 2 2
354,060	10	,,	12	Do. £7 10s. paid	16½—17½	..	5 2 10
15,181,590	Stk.	Aug. 15	4⅛	Gas- light and Coke 4 p.c. Ord. . . 3½ p.c. max. . . 4 p.c. Con. Pref. 3 p.c. Con. Deb.	93—95	+1	4 12 7
2,600,000	,,	,,	3½		86—88	..	3 19 7
3,799,735	,,	,,	4		101—104	..	3 16 11
4,193,975	,,	June 13	3		81—83	..	3 12 3
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	93—98	..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	114—117	..	5 11 1
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	19—20	..	5 10 0
4,940,000	Stk.	Nov. 14	8	Imperial Continental .	167—170	..	4 14 2
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	91—93	..	3 15 3
195,242	Stk.	?Aug. 29	6	Lea Bridge Ord. 5 p.c. .	110—120	..	5 0 0
306,083	,,	June 27	4	L'rpool Unit'd Deb. Stk.	108—110	..	3 12 9
£			p.c.				£ s. d.
561,000	Stk.	Aug. 29	10	Liverpool United A . .	220—222	..	4 10 1
718,100	,,	,,	7	Do. B. .	157—159	..	4 8 1
152,736	Stk.	Feb. 14	7⅜	Maidstone 5 p.c. . .	140—145	..	5 5 2
75,000	5	Nov. 28	5	Malta & Medn., Ltd. .	4—4¼*	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb..	99—101	..	4 19 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 14	3½	Monte Video, Ltd. . .	10½—11½	..	6 1 9
1,775,892	Stk.	Aug. 15	4⅜	Newc'tle & G'tesh'd Con.	106—107	—½	4 6 5
406,025	Stk.	June 27	3½	Do. 3⅜ p.c. Deb.	89—90	..	3 17 9
15,000	10	Aug. 29	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 28	8	Oriental, Ltd. . . .	135—138*	..	5 15 11
60,000	5	Sept. 13	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	Oct. 30	7	Primitiva Ord. . . .	6½—7	..	5 0 0
796,980	5	July 31	5	Do. 5 p.c. Pref. .	4⅝—5⅛	..	4 17 7
488,900	100	Dec. 2	4	Do. 4 p.c. Deb. .	92—94*	..	4 5 1
1,000,000	10	Oct. 11	8	River Plate Ord. . . .	12¾—13¼	..	6 0 9
312,650	Stk.	June 27	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1
250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	13—13½	..	5 18 6
125,000	50	July 1	5	Do. 5 p.c. Deb. .	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	243—245	..	4 1 8
209,984	,,	,,	10	Do. B	243—245	..	4 1 8
523,500	,,	,,	10	Do. C	243—245	..	4 1 8
70,000	10	Nov. 14	10	South African	14½—15½	..	6 9 0
6,429,895	Stk.	Aug. 15	5⅛	South Met., 4 p.c. Ord.	119—121	..	4 10 11
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	81—83	..	3 12 3
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	155—157	..	5 1 11
605,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	114—117	..	4 14 0
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	117—120	..	4 3 4
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120—125	..	4 0 0
502,310	Stk.	Nov. 14	5	Southampton Ord. . .	104—109	..	4 11 9
120,000	Stk.	Aug. 15	6¾	Tottenham A 5 p.c. . and B 3½ p.c. .	120—123	..	5 9 9
398,940	,,	,,	5¼		100—103	..	5 1 11
149,470	,,	June 27	4	Edmonton 4 p.c. Deb.	99—101	..	3 19 3
182,380	10	June 13	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
193,742	Stk.	Aug. 29	5	Tynemouth 5 p.c. max.	107—109	..	4 11 9
30,000	Stk.	Feb. 14	8	Wands- worth A 5 p.c. . . and C 3½ p.c. . . B 3½ p.c. . .	—	..	—
255,636	,,	Aug. 15	6¼		128—133	..	4 17 9
75,000	,,	,,	5⅝		—	..	—
80,075	,,	June 27	3	Putney 3 p.c. Deb. Stk.	75—80	..	3 15 0
845,872	,,	Aug. 15	3½	West Ham 5 p.c. Ord. .	100—103	..	4 19 6
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	118—120	..	4 3 4
228,300	,,	June 27	4	Do. 4 p.c. Deb. Stk.	101—104	..	3 16 11

Prices marked * are "Ex div."

prompt clearance. On the east coast, 21s. 6d. to 21s. 9d. has been accepted; while values are not over 20s. 3d. in Manchester and 21s. 3d. in Liverpool, and even these figures are rather over the parity of prices which are stated to have been accepted in Belgium and North France. Creosote is quiet for prompt delivery, but fairly steady for forward, and, as manufacturers appear to be fairly well sold, should maintain its value. Benzol 90 per cent. is steady, but low in price; while 50-90 per cent. benzol and toluol are neglected. Solvent is very quiet, especially in the North, where very low figures are reported to have been accepted. Crude carbolic is easier; and the covering in by dealers, which has been keeping the market firm for some time past, now appears to be finished. Continental consumers refuse to offer more than 1s. 7d. for prompt or forward delivery; and crystals are below the parity of even these figures.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d., *ex* works. Pitch, London, 23s. to 23s. 6d. f.o.b.; east coast, 21s. 3d. to 21s. 9d. f.o.b.; west coast, 20s. 3d. to 21s. 3d. f.a.s. (Manchester and Liverpool). Benzol, 90 per cent., 8¼d. to 8¾d., casks included; North, 8d. to 8¼d., casks included; 50-90 per cent., 8d. to 8½d., casks included. Toluol, 10d., casks included; North, 9¼d. to 9¾d., casks included. Crude naphtha, 3⅜d. to 4d., in bulk; North, 3¼d. to 3⅜d., in bulk; solvent naphtha, 11d. to 1s., casks included; North, 9½d. to 10½d., casks included; heavy naphtha, 11½d. to 1s. 0½d., casks included; North, 10d. to 11d., casks included. Creosote, London, 2¼d. to 2⅜d., in bulk; North, 2¼d. to 2⅜d., in bulk. Heavy oils, 3⅛d., in bulk. Carbolic acid, 60 per cent., east coast, 1s. 7½d. to 1s. 7⅝d., casks included; west coast, 1s. 6½d. to 1s. 7d., casks included. Naphthalene, £6 10s. to £12 10s., packages included and f.o.b.; salts, 42s. 6d. to 45s., bags included and f.o.b. Anthracene, "A" quality, 1¼d. to 1⅜d., packages included and delivered; "B" quality, unsaleable.

Sulphate of Ammonia.

This article is quiet, chiefly owing to the lack of prompt orders; but the stocks are known to be small. The principal London Gas Companies are well sold, and maintain their previous quotations. Outside makes, however, could be secured upon Beckton terms at £11 15s. to £11 17s. 6d. per ton. In Hull, business is reported to have been done at £11 16s. 3d.; and in Liverpool at £11 17s. 6d. In Leith, manufacturers ask £12 5s., but cannot obtain this figure, though it is doubtful if there are sellers at less, as the Scotch makers are known to be particularly well sold.

The road leading from Willenhall to Short Heath has long been subject to subsidences caused by underground fires; and so probably no great surprise was felt last Friday week, when two deep holes were found, one on each side of the road, connected by a wide fissure. The water-main was broken by the fall of earth. Watchmen were promptly engaged to prevent accidents to travellers, while workmen were employed in making good the damage.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Never was the coal trade of the county in a better or more prosperous condition than at the present moment. The demand for all kinds of fuel, from the commonest rubbish to the finest seams, is really amazing, and to a certain extent very gratifying. It is in steam coal that there are the greatest needs, which is owing to the largely increased sources of demand. House coal, too, is just now being called for in larger quantities. It is no exaggeration to say that coalowners in the Manchester and Wigan districts of the county are unable to keep pace with the general demand. Orders have positively to be refused. Gas coal and cannel are in the same category. There is no change to record in prices at the pits, though in past years an increase on the 1st of December has not been unusual. Reports of a like character come from the South Yorkshire coalfields, as also from Nottinghamshire and Derbyshire. A good deal of coal is being sent away, not only from Liverpool and the Ship Canal tips, but also from Goole, Hull, and Grimsby. Retail prices of house coal in this county are almost on a par with those charged in the Metropolis.

Northern Coal Trade.

In the coal trade, there is a good demand for best qualities; but for other kinds, the abundant supplies give ease in price. The shipments of best coals are heavy; and this must be expected to continue for the remainder of the year, as the collieries are well booked for the rest of the month. In steam coals, best Northumbrians are from 15s. 4½d. to 15s. 6d. per ton f.o.b., second-class steams from 14s. to 14s. 6d., and steam smalls are lower at from 8s. to 8s. 9d. The production of coals of all classes seems to be heavy. In the gas coal trade, the demand is strong, more especially for best Durhams. The prices vary, according to quality, from about 12s. 9d. to 14s. 6d. per ton f.o.b., with perhaps 3d. to 6d. above the latter figure for "special" kinds. There is now more inquiry for supplies for export over the early months of next year. Buyers seem desirous of contracting for such at something below 12s. 6d. per ton f.o.b.; but the collieries ask higher prices. It must be expected that after the end of this month Durham coals will be actually and relatively more plentiful; and this may influence prices. In coke, the market is easier, and gas coal is affected. The export demand is fair; and good gas coke is quoted about 19s. to 19s. 3d. per ton f.o.b. Some inland producers have fairly heavy stocks, and prices show ease.

Scotch Coal Trade.

Trade has been fairly active. There has been a falling off in the quantity shipped; but the collieries have not suffered thereby, as the home demand, particularly for household uses, has improved. Prices have eased a little during the week. They are now: Ell 13s. 6d. to 15s. 6d. per ton f.o.b. Glasgow, splint 15s. to 15s. 3d., and steam 13s. 3d. to 13s. 6d. The miners recently asked an advance in wages

An Order for

"DIAMOND" Gas-Fires

will secure

DELIVERY

BY

RETURN.

May we show you what we can do?

DAVIS the Gas Stove People.

equal to 18¾ per cent. In response, the coal masters offered 6¼ per cent. The matter was referred to Lord Ardwall, as neutral Chairman of the Scottish Coal Trade Conciliation Board. Parties were heard by his Lordship on Monday; and on Wednesday he issued his award, in which he gave effect to the view of the masters. The wages are now 7s. 6d. per day—an increase of 50 per cent. during the past twelve months, upon the basis adopted in 1888. The shipments for the week amounted to 261,424 tons—a decrease of 57,277 tons upon the preceding week, and of 17,045 tons upon the corresponding week of last year. For the year to date, the total shipments have been 13,593,176 tons—an increase of 761,917 tons.

Fatal Result of a Gas Explosion.—A Coroner's Jury at Newcastle-upon-Tyne returned a verdict of "Accidental death" in the case of a Miss Elizabeth Curry, who, with her sister Ethel and a maidservant, was injured by a gas explosion at Gateshead early last month. They were cleaning a house that they had just moved into, and Miss Ethel Curry, with a lighted taper in her hand, mounted a ladder to put some water in a chandelier. Immediately there was an explosion, the full force of which was caught by the deceased. An official of the Gas Company drew attention to the danger attaching to these water-slide fittings, the use of which he said his Company did not encourage.

Water Supply of London in October.—At the meeting of the Metropolitan Water Board last Friday, the statistical return presented in regard to the supply of water for the month of October showed that the total average daily quantity was 221,340,000 gallons. The number of houses served was 1,071,506, and the estimated population 6,950,638. The mean supply per head per day was 31·8 gallons, compared with 32·5 gallons in the corresponding month of last year. The quantity of water in store in impounding reservoirs at the end of the month amounted to 5336 million gallons, against 5411 millions in October, 1906. During the month, 1460 additional supplies were put on, and 10,850 yards of new mains were laid.

Gas Exhibition at Devizes.—Under the auspices of the Devizes Corporation Gas Department, Messrs. John Wright and Co. recently held in the Town Hall a most successful exhibition of their various gas appliances. The ex-Mayor (Alderman Simpson), as Chairman of the Gas Committee, formally opened the exhibition, and in an interesting speech referred to the greatly increasing popularity of modern gas appliances in the town, and to the many new directions in which gas was now being utilized. The audience were informed that the Gas Committee had decided to let out on simple hire and on the three-years hire-purchase system Messrs. Wright's "St. Andrew" gas-steam radiators. Miss Lillie Miles gave cookery lectures and demonstrations; the hall being crowded on each occasion.

Gas Profits at Spalding.—According to a statement in a local paper, a settlement has been arrived at with the Local Government Board with respect to a sum of £1000 surcharge on the Spalding Urban District Council in respect of profits from the gas undertaking which had been transferred to the general district account for the reduction of the rates. The Board's Auditor held that, under the Council's Provisional Order, they could not devote the gas profits to the rates until the rate for public lighting had been extinguished. The Council contended that they could devote the profits to the rates, provided the gas lighting rate was reduced from these profits. The Local Government Board upheld the Auditor in the surcharge; and it has been arranged that the sum of £557, being the full amount of the gas lighting rate, shall be transferred to a gas-works reserve fund, and that the remainder shall go towards the reduction of the rates.

Gas Supply in South Africa.—On the occasion of the eleventh annual entertainment of the employees of the South African Lighting Association, Limited, recently held in the Town Hall, Port Elizabeth, under the presidency of Mr. William Arnott, the local Manager, when an excellent programme was gone through, he delivered an address in which he gave some particulars as to the position of the Association. He said they had now 3380 consumers, and had put on 451 new ones since their last meeting. They had some 1330 shilling-in-the-slot meters in use, and 1364 cooking-stoves fixed. Some 93 new consumers were put on during October. Johannesburg, with a population five times that of Port Elizabeth, had gas-works which were run by the Municipality, and could not boast of 300 consumers—one-twelfth the number of those at Port Elizabeth. Gas was 19s. per 1000 cubic feet, and was now reduced to 15s., compared with Port Elizabeth cooking gas at 7s. 5½d. Their coal cost 23s. per ton, whereas that at Port Elizabeth came to 43s. per ton. The South African Lighting Association, though not a charitable institution, was a benefit to the town, in that they supplied good gas at the lowest rate in South Africa. They paid upwards of £12,000 per annum in salaries and wages, which was spent in the town, and some thousands in local purchases; and they did their best to justify their existence.

Manchester Corporation and Fitting Work.—In the report of the General Secretary of the Federated Association of Ironmongers for the past month, he states that, with the view of ascertaining exactly how the Manchester Corporation conduct their gas undertaking, he took an opportunity of consulting Alderman J. R. Wilson on the subject. He found: (1) That the Corporation do not do any internal work in gas-fittings. That beyond the meter, as far as private houses are concerned, all is left to the trade. (2) The city show-room prices charged for gas cookers, fires, &c., to the public leave a margin of 20 per cent. to the trade. (3) The Corporation do not stock or deal in gas-fittings. (4) Regarding the fixing of work required to be done by the Corporation for gas-cookers, &c., tenders are asked in different areas annually from ironmongers, plumbers, &c., and the latter are appointed by the Corporation to do the work of fixing, &c., according to quotations sent in for one year only. The Manchester Corporation do not supply fittings or lamps; and the electrical contractors of the city do the wiring and all other work appertaining to house and internal requirements. The Corporation let on hire electric motors, but do not fix or supply the appurtenances—the trade are left to do this work. He adds: "As far as my knowledge goes, this Corporation are treating the trade fairly. This, however, is not the case, by a long way, with other Corporations of the country."

S&P

SAWER & PURVES

PREPAYMENT METERS.

WET AND DRY.

MANCHESTER & NOTTINGHAM.

M&N

Shanklin Water Supply.—It has been reported to the Shanklin Urban District Council that the yield of water from the first shaft driven at the Chillerton works is highly satisfactory. The quantity is already 50,000 gallons in 24 hours, though the progress made so far is only 20 feet out of a total of 306 feet, the length of the adit between the two shafts.

Cuckfield Water Supply.—Satisfactory progress is being made with the supply of water for Cuckfield, Sussex, for in a fourteen days' test made at the main borehole the yield was about 2¼ million gallons. This gives an average supply of 160,000 gallons per day. It has, however, been decided by the Rural District Council not to provide water for the adjacent district, as was suggested.

Clacton Gas-Works Improvements.—Mr. R. H. Bicknell has, on behalf of the Local Government Board, held an inquiry at Clacton, respecting the Urban District Council's application to borrow the sum of £5900 for the purposes of their gas undertaking. It was stated that £4000 was for additional working capital, and £1910 for improvements and additional plant. Mr. Quick, representing the Ratepayers' Association, questioned the Engineer (Mr. S. Francis) at some length on the figures relating to the working of the undertaking since the Council took it over seven years ago. Mr. Francis, however, said the concern was in a sound financial position.

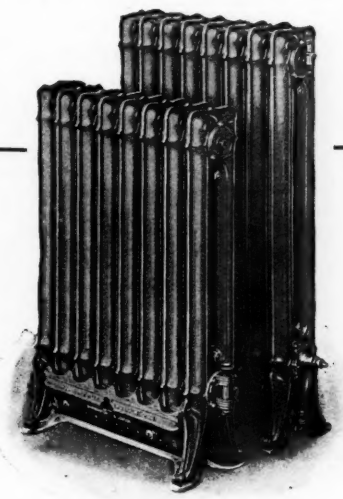
Modern Gas Lighting at a Devonport Church.—The church of St. John the Baptist, Devonport, has just been fitted with gas-lights on modern lines. Formerly there were distributed throughout the building 110 flat-flame burners, consuming about 600 cubic feet of gas per hour, and giving an illumination of only about 1800 candles. These have been replaced by six Welsbach self-intensifying lamps suspended at regular intervals from the ceiling, and about 40 inverted incandescent gas-burners distributed equally throughout the church. The effect of these changes is to increase the illuminating power to 5500 candles; while the consumption of gas is only 250 cubic feet, costing 7½d. per hour. The taps are arranged in a control-box, so that the lights can be raised and lowered at will. Messrs. Willey and Co., of Exeter and Devonport, carried out the work.

Winsford Gas Supply.—The accounts of the Gas Department of the Winsford Urban District Council for the year ending the 31st of March have just been issued. The total expenditure was £2576—gas making costing £1443; while the receipts amounted to £4399, of which £3258 was for gas and £759 for residual products. The profit realized during the year was £1485. The quantity of gas made was 22,698,200 cubic feet, compared with 21,369,900 cubic feet in the preceding twelve months; being an increase at the rate of 6·21 per cent. The gas sold was 19,497,400 cubic feet, which was nearly 7 per cent. more than in the year 1905-6. The coal carbonized was 398 tons 3 cwt.; the production of gas per ton being 11,427 cubic feet, or 305 cubic feet per ton more than before. There was an addition of 102 prepayment and 13 ordinary consumers during the twelve months; bringing up the numbers to 669 prepayment and 372 ordinary consumers.

Defective Electric Lighting at Chelmsford.—Calling the attention of the Chelmsford Town Council to the "wretched state of the public lighting in the streets during the last month or so," Alderman Taylor pointed out that they paid £1500 a year for public lighting; and he thought that it was high time they made a strong protest against the miserable way in which they were being treated by the Electric Lighting Company. Mr. Spalding, the Chairman of the Lighting Committee, said he had communicated with the Engineer of the Company, who told him they were doing their best to adjust the new lamps. He was at Colchester the previous week; and of all the wretched public lighting, that was the worst. Alderman Thompson asked whether it was not time the Council sent some representation to the Company; and he moved that they should write to the Company requesting them to devote their serious atttention to the matter. Mr. Clarkson seconded with the remark that they ought to get a better light for the money. The proposition was agreed to.

Emptying Slot Meters at Coventry.—The Coventry Chamber of Commerce have had their attention called to the scarcity of bronze coins, due, it is stated, to the extended use of penny-in-the-slot gas-meters; and the necessity of a more frequent collection is emphasized. The Chamber decided to request the Town Clerk to bring the matter before the notice of the Gas Committee of the Corporation, with the view to arrangements being made for the meters being emptied more frequently than at present, and, if necessary, for the appointment of additional collectors. The Committee have just resolved to engage another collector, though it is argued that no delay takes place in collecting the money placed in the slot-meters. The plan adopted is for the collectors to be met in the district by a person in charge of a tricycle carrier, in which the money, made up into 5s. packets, is taken direct to the central office, and, after being checked, deposited in the bank, whence it is distributed to other banks and among tradespeople as required. In Coventry, of recent years, owing to the rapid development of the city and the number of new houses erected, there has been a great increase in the use of slot-meters.

Fatality through a Barrowload of Coke.—An elderly woman named Mary Ann Rendel met her death under somewhat strange circumstances at Exmouth last Tuesday. A horse and cart had been sent from a neighbouring village to the Exmouth Gas-Works for a load of coke. The man in charge put a chain on the wheel of the cart and a stone in front of it, and then proceeded to load the coke. While he was doing so, one of the stokers passed with a barrowload of hot coke, the steam from which caused the horse to start and swerve. The movement overturned some scales, and the horse, now thoroughly frightened, bolted. In the street close by it knocked down Mrs. Rendel, and so severely injured her as to cause practically instantaneous death. At the inquest, the Coroner suggested that there ought to be some regulation to prevent steaming coke being wheeled about near to horses coming to the yard. The stoker who wheeled the barrow said he had never known of a horse being frightened by the steam, and had previously passed this horse with a barrow of coke without alarming it. The horse had, in fact, been to the gas-works many times before. A verdict of "Accidental death" was returned.



A MINISTER *writes:—*

Nov. 23, 1907.

"I have pleasure in bearing testimony to the efficiency of your

GAS-STEAM RADIATORS,

which were placed in our Institute Room and Lecture Hall last winter. They heated our large room admirably; caused no anxiety, and were no trouble. We have been so pleased with their efficiency that my Church Committee are considering ways and means of having our present Hot Water Apparatus in the Church replaced by your same Radiators."

Richmond's

"Monarch"

GAS-STEAM RADIATORS.

ADVERTISEMENT OF THE RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 182, QUEEN VICTORIA STREET, E.C.
General Offices and Works: WARRINGTON, &c.

New York Water Supply.—The immense reservoir formed by the new Croton dam, in connection with the water supply of New York, has lately been filled, and water ran down the spillway for the first time on the 6th ult. The reservoir has a capacity of 38,000 million gallons.

Chelsea Public Lighting.—According to the annual report of the Borough Engineer of Chelsea, which has just been issued, there are in the district 1565 public gas-lamps, which represent an increase of 25 during the twelve months. The outlay for the year was £6297, made up as follows: Gas supplied to public lamps, £4515; maintenance of lamps, £1248; improving lighting, including new lamps and lanterns, £408; wages and incidentals, £125. The lamps were lighted for 3898 hours during the year.

Defective Electric Lighting at Felixstowe.—The "East Anglian Times" says of late the electric light at Felixstowe has been most unsatisfactory, and considerable inconvenience has been caused to shopkeepers and residents. Notwithstanding that the arc lamps on the promenade have been turned off for several nights, the power has not given sufficient light for the shopkeepers and householders; so that lamps, gas, or candles have had to be requisitioned. The culminating point, it is said, was reached last Saturday week, when the light sank to a faint glimmer throughout the town, and the inhabitants had to depend entirely on other forms of illumination. A breakdown at the works is given as the reason for the unsatisfactory state of things that has prevailed.

Half-Year's Working at Loughborough.—Submitting the half-yearly report of the gas undertaking, Alderman Bumpus informed the members of the Loughborough Town Council that the period had not been a very favourable one for making profits. They had had to pay something like £140 more in rates; and they were burdened with a serious rise in the price of coal. However, they had not done so very badly; for they had been able to pay £1867 to the credit of the profit and loss account, which was £24 more than in the corresponding period of last year. This favourable result was brought about by an increase in the price of residuals, and also by the fact that the slot-meter consumption had grown. Despite the competition of the electricity department, there had been an increase of nearly 2 per cent. in the sale of gas.

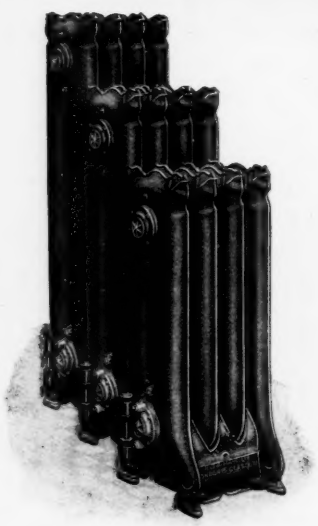
The Re-Imposition of Meter-Rents by the Gaslight and Coke Company.—In the "JOURNAL" for the 26th ult. (p. 663), it was reported that this matter had been under the consideration of the Lighting Committee of the Hampstead Borough Council, on a circular-letter received from the Islington Borough Council asking for support in an appeal to the Board of Trade for an inquiry into the administration and expenditure of the Company. The Committee recommended that no action should be taken by the Council; but as there was an equal division of opinion as to the advisability of supporting the Islington Council, the Committee agreed to further consider the matter. At the meeting of the Hampstead Council last Thursday, they reported that they adhered to their previous decision; and, after some explanation by the Chairman of the Committee (Alderman Pritchard) in defence of the Company, the original recommendation was approved.

Threatened Surcharge at Otley.—From some remarks recently made by the Chairman of the Otley Urban District Council (Mr. C. E. Craven), it appears that certain of the members have been threatened with a surcharge in respect of a payment to the Otley Gas Company. He said that nearly three years ago it was thought desirable to convert the street-lamps into the incandescent system; and arrangements were made with the Gas Company to do this work for £260—the principal and interest to be repaid at the rate of £80 a year. The Auditor, on the voucher being produced for the payment to the Company of £80, told them that the agreement was illegal, and threatened to surcharge the members who signed the cheque. The arrangement was made with the Company in good faith, and with the distinct idea that it was to the advantage of the ratepayers; the cost of the improvement being the actual amount it was estimated they would save by the change to incandescent lighting. He had no doubt that, when the matter was explained, the difficulty would be got over.

Wages and Holidays at Oldham.—Some days ago, the Oldham Corporation Gas Committee were waited on by Mr. J. R. Clynes, J.P., M.P., and a deputation of four men representing the gas workers and labourers, in regard to the question of an advance of 3d. per shift for the gas workers engaged in the carbonizing department, and also for a week's holiday each year to such men as were engaged in gas producing for forty weeks in the year. The labourers also asked for a week's holiday to men who had over ten years' service to their credit. Application was further made for an advance of 2s. per week to the meter men; and the men asked for expenses through travelling to their work. The Chairman pointed out that the holiday question was a very important one, and certainly could not be considered by the Committee alone. If the subject was entertained, then all the Corporation departments employing labour would have to be agreeable. The question of increased wages and expenses for travelling could not be discussed at that meeting. It was decided to call a special meeting.

Huddersfield and Compensation Water.—At a special meeting of the Huddersfield Town Council, held to sanction the promotion of a Bill in the next session to vary the Corporation's Water Acts in reference to the manner of the distribution of compensation water and for other purposes, an amendment was moved by Mr. Thomas to the effect that to clause 28, which provided that in case of neglect of the Corporation to give the requisite daily flow of compensation water to the mill occupiers and to other works entitled to receive it, the Corporation should forfeit £5 per day and be liable to action for damages, there should be added words which would render the Corporation liable as aforesaid "except in cases where there is not sufficient supply for domestic purposes." Alderman Walker, however, pointed out that the Corporation were bound by Act of Parliament, without any qualification whatever, to give 2¼ million gallons of compensation water daily. This was the mill occupiers' right on the banks of the streams; and the Corporation could not help themselves. He wished they could. The resolution to promote the Bill was carried by 36 votes to 4; the few dissentients being Socialists.

RADIATORS



PLAIN OR ORNAMENTAL.

WHEN A TRAVELLER TELLS YOU HE IS SELLING THE BEST RADIATOR, YOU MAY BE SURE THAT IT IS

THE "ST. MUNGO" GAS HEATED STEAM RADIATOR

HE IS TALKING ABOUT.

FITTED WITH GAUGE GLASS,
GAUGE GLASS PROTECTOR,
GAS & AIR ADJUSTER,
AUTOMATIC AIR VALVE,
AUTOMATIC GAS REGULATOR,
FIXED CAST-IRON BASE,
AND ALL THAT IS BEST
IN RADIATOR CONSTRUCTION.

HIGHEST GRADE.

R. & A. MAIN, LD.,

LONDON, GLASGOW, FALKIRK.

Ampthill Water Supply.—The new water supply which has been provided for the town of Ampthill is now in use. The source is the lower greensand water-bearing beds at Clophill; and the water, after being softened, is pumped 4¼ miles to a reservoir, on a height in Ampthill Park, whence it gravitates into the town. The cost of the undertaking has been about £10,000.

Sale of Bristol Gas Stock.—Last Thursday, Messrs. G. Nichols and Co. offered for sale by auction £25,000 of 5 per cent. maximum ordinary stock and £10,000 of 4 per cent. debenture stock of the Bristol Gas Company; the minimum prices of the two stocks being £113 and par per £100. The 5 per cent. stock fetched an average of £114 7s. 9d.; and the debenture stock from £101 to £102 10s. The total amounts realized by the sale were £28,597 and £10,179 respectively.

Breakdown at Aberavon.—In its issue dated yesterday, the "South Wales Daily News" said: "In consequence of the very bad light supplied at Aberavon on Friday night, a special sitting of the Gas Committee of the Aberavon Town Council was held at the new gas-works on Saturday. Mr. Newbigging, of Manchester, the Engineer, was present. As the result of the investigations, several defects were discovered; and it was decided to restart the old gas-works at once to supply light for the town to-night."

International Metal Tube Combine.—It is reported that, as the result of a representative conference of international steel-tube manufacturers recently held in Paris, the difficulties in the way of an international metal tube combine have been removed, and sufficient support has now been promised to make a working agreement practicable. Provisional terms have been accepted by the English, German, Belgian, French, and American representatives defining the respective spheres of influence of each country, fixing minimum prices at ports of shipment, restricting output, and preventing dumping and excessive accumulation of stocks. It is understood that the combine will not control the action of individual manufacturers in home markets. The immediate effect of the arrangement has been the restoration of 30s. per ton, by which prices were reduced in September last.

The Directors of the Welsbach Incandescent Gas-Light Company have declared an interim dividend on the preference shares at the rate of 6 per cent. per annum for the half year ending Sept. 30 last.

Tenders for the new issue of £5000 of ordinary "B" stock of the Redhill Gas Company, in accordance with the recent advertisement in the "JOURNAL," were opened last Tuesday. The amount offered was allotted at an average price of £102 11s. 8d. per £100 of stock.

The Praed Patent Safety Gaslight Company, Limited, has been registered with a capital of £5000, in £1 shares, to acquire the business of manufacturer and installer of apparatus for carburetting air and producing gas carried on by M. B. Praed as the Praed Safety Gaslight, and to adopt an agreement with M. B. Praed and R. G. Gore.

A special meeting of the shareholders of Messrs. James Milne and Son, Limited, was held at Milton House Works, Edinburgh, last Friday, to consider special resolutions relating to the reduction of capital. Mr. James Milne presided over a moderate attendance; and, after some discussion, the resolutions were unanimously agreed to.

On Monday last week, Mr. J. H. Hill, the Secretary and Manager of the York United Gas Company, gave an interesting lecture, accompanied by experiments, on the manufacture and uses of gas, at a meeting of the Southlands Young People's Association. The lecturer made all the processes quite plain to his audience by means of a model gas-works; and he showed examples of high-pressure lighting.

On the Clerk reporting to the Gainsborough Rural District Council that the Lincoln Corporation had served them with notice in reference to the parliamentary powers they were going to apply for in regard to their proposed water supply, as they would have to come through the district to carry the supply from Retford to Lincoln, it was left to him to lodge formal objection with a view to obtaining the insertion of a clause so that the Gainsborough Council might take advantage of the Statute with respect to supplying their own district from the proposed works, if ever such necessity arose.

What is said to be the largest hall in the North of England—the Manchester Free Trade Hall—has just been most successfully lighted by means of thirteen 2-light and four 3-light Podmore lamps, fixed at an altitude of 40 feet; the size of the hall being 56 feet high, 75 feet wide, and 125 feet long. The lamps (the whole of which are controlled by one tap from the platform) take the place of seventeen corona lights with ordinary naked flames, the consumption of which was about 1400 cubic feet per hour, as compared with an approximate consumption by the new lamps of 250 feet an hour. The Resident Engineer states that the hall was never better lighted, and there is absolutely no trouble.

The first annual concert of the Horseferry Swimming Club, which was promoted by the staff of the Gaslight and Coke Company, was held on Monday last week, at the Holborn Restaurant. Mr. D. Milne Watson, the General Manager of the Company, occupied the chair, and the concert was largely attended. At the conclusion of the first part of the programme, Mr. Watson, as President of the club, distributed the prizes which had been won by the successful competitors in the races of the past season; and in reply to a vote of thanks, proposed by Mr. Jarratt, he congratulated the members not only on their proficiency in the necessary, but somewhat difficult, art of natation, but also on the high standard of musical talent which had been provided.

An inquiry has been held by Mr. H. A. Reed, on behalf of the Local Government Board, into an application by the Dawley Urban District Council for sanction to the borrowing of £14,000 for the purposes of water supply, including the execution of certain works in the borough of Wenlock and the construction of a reservoir with a capacity of more than 100,000 gallons at Lawley Bank in the Wellington rural parish. There was no opposition to the scheme, which the Engineer (Mr. Raikes) explained provided for 10 gallons of water per head per day for a population of 10,000 (the present population being 7670). The supply will be obtained from Wenlock (who have met the Council in a satisfactory manner); and the water will be distributed by means of stand-pipes in the streets.

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WORKS ASSISTANT. Swindon United Gas Company. Applications by Dec. 23.
DRAUGHTSMAN. No. 4877.
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CHARGE OF WATER-WORKS. Carnforth Water Company.
GAS-FITTER. Penistone Gas Company.

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BOILER. Redditch Gas-Works.

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SALFORD GAS DEPARTMENT. Tenders by Dec. 19.

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TIPPERARY GAS COMPANY. Tenders to the Engineers by Dec. 16.
WICKLOW GAS COMPANY. Tenders to the Engineers by Dec. 23.

Oxide of Iron (Spent).
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ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. Tenders by Dec. 27.

Tar and Liquor.
BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by Dec. 23.
WORKSOP GAS COMPANY. Tenders by Dec. 27.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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